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THE ILLUSTRATED
INTERNATIONAL AIRCRAFT GUIDE

TURBOPROP AIRLINERS

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Consultant BILL GUNSTON

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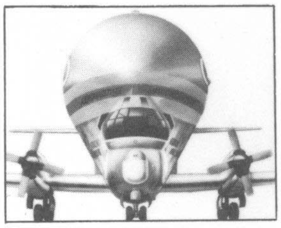

Cover: Aero Spacelines Guppy

The turboprop engine, which was developed at the close of World War II as a powerplant for high-performance fighters, was soon to become the standard engine for many commercial long-range airliners.

This book covers the early experimental types in the 1940s, the classic airliners of the 50s like the Britannia and Viscount and the modern executive machines. It also features aircraft which have prolonged their flying life with the installation of turboprop engines.

Today, one of the major attractions of the turboprop is that it has a low running cost which, with increased fuel prices, makes it popular with short-range freight and passenger operators. The Aero Spacelines Guppy is the ultimate expression of the turboprop freighter since, with its cavernous hold, it can carry whole sections of aircraft fuselages.

Turboprop Airliners is part of a series of titles which combine to give a complete history of aviation.

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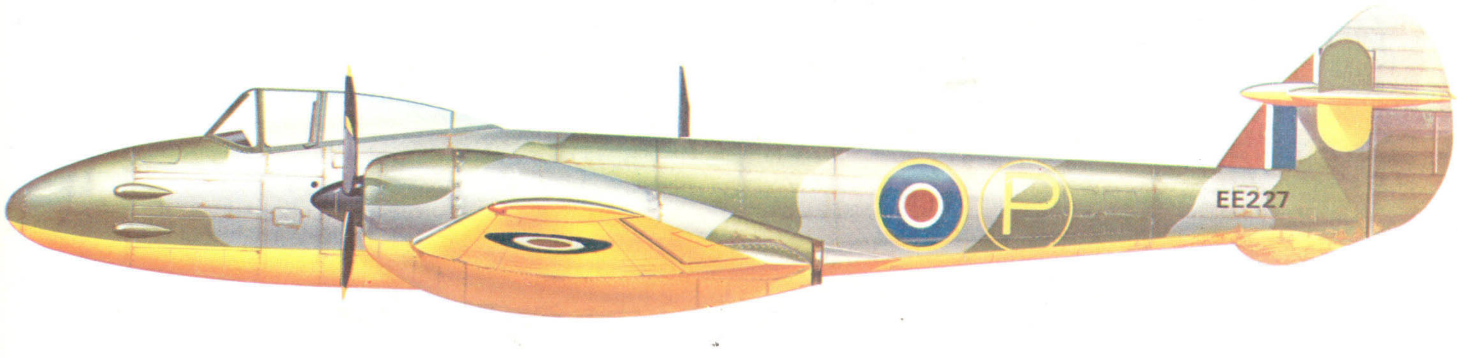
Trent-Meteor, Gloster

FIRST FLIGHT 1945



THE Gloster Trent-Meteor, although in no way an airliner, has a unique place in aviation history as the aircraft which pioneered turboprop power, and this type of powerplant has since become one of the standard types of engine used on short- and medium-range airliners.

The aircraft used for the Trent conversion was one of the first batch of production Gloster Meteor F.1 fighters, EE227, modified for trials.

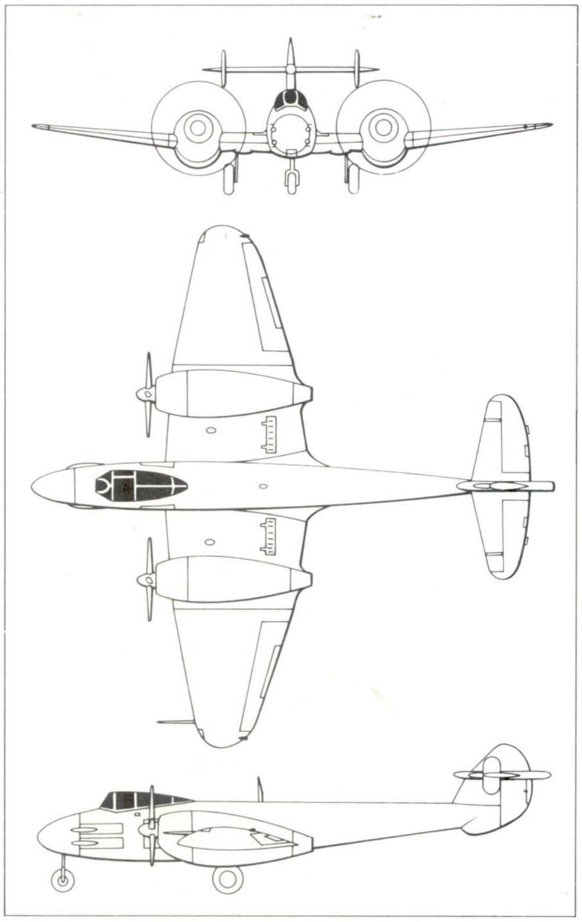
In February 1945, with the RAF's immediate needs catered for by the delivery of the improved Meteor F.3, EE227 was converted back to F.1 standard and handed over to the Rolls-Royce facility at Hucknall as a flying testbed for the newly developed RB.50 Trent propeller-turbine, or turboprop. Such a powerplant seemed to offer many of the advantages of turbine power (relative simplicity, high power and lack of vibration) combined with the proven capabilities of the propeller (high aerodynamic efficiency even up to quite high Mach numbers). Rolls-Royce therefore began to develop the experimental Trent in May 1944, using as the basis of the engine the centrifugal-flow Derwent turbojet which was to power the F.3 and later marks of the Meteor.

The Trent-Meteor needed little modification for the accommodation of the Trent powerplant, though the nacelles were somewhat larger, which, with the extra side area of the propellers, entailed the fitting of two small auxiliary fins towards the outboard ends of the tailplane to ensure directional stability. The Gloster Trent-Meteor first flew on September 20, 1945 and thereafter contributed greatly to the development of turbine engines as pure turbojets and as turboprops. In its first form, the Trent-Meteor was fitted with five-blade Rotol propellers, each having a diameter of 2.41 m (7 ft 11 in), though some reports claim a propeller with a diameter of 2.31 m (7 ft 7 in) absorbing 750 hp and leaving 454 kg (1000 lb) of residual thrust. Later, the aircraft was modified to accommodate propellers with a diameter of 1.49 m (4 ft 10½ in), absorbing only 350 hp and leaving a residual thrust of 635 kg (1400 lb) to emerge from a squeezed orifice.

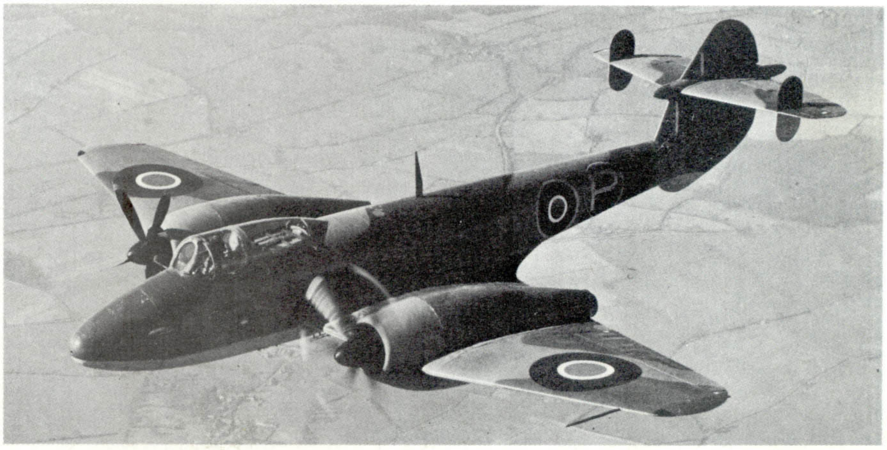
The Trent was intended only as a research engine, and valuable results were obtained, especially in determining the effect of a propeller hub on the efficiency of the turbine's air intake, and in the development of suitable reduction gears.

Trent Meteor

Type: experimental aircraft
Maker: Gloster Aircraft Co
Span: 13.12 m (43 ft)
Length: 12.57 m (41 ft 3 in)
Height: 3.96 m (13 ft)
Wing area: 34.75 m^2 (374 sq ft)
Weight: not available
Powerplant: two 1750-ehp Rolls-Royce RB.50 Trent turboprops
Performance: not available
Payload: none
Crew: 1
Production: 1



Above: The Trent-Meteor, flying testbed to explore the concept of the turboprop
Below: Flying on one engine



Hermes V, Handley Page

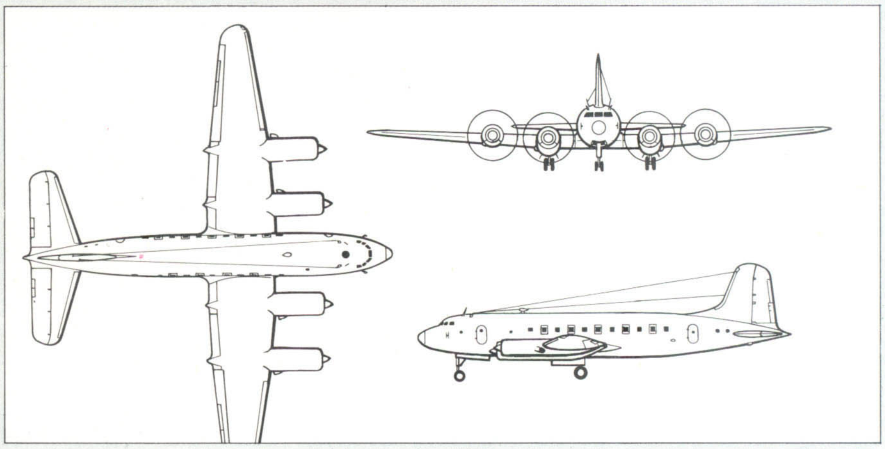
FIRST FLIGHT 1949

VARIOUS delays in the development of the HP.64 Passenger Version, Freighter Version and Military Transport, slowed the 1943 Handley Page programme, but the type finally emerged as the Handley Page Hastings transport for the RAF, and the Hermes airliner for the British Overseas Airways Corporation.

The possibility of producing a turboprop-powered version of the Hermes II was first considered in February 1946, with the Bristol Theseus as the prospective engine. Consideration was also given to a nosewheel-version of the aircraft. At this time the names for the family were Hermes I for the prototype which had crashed on December 3, 1945 on its first flight; Hermes II for the proposed lengthened version of the Hermes I, the HP.74; and Hermes III for the Theseus-engined HP.74. The types were to have basic seating for 64 passengers five-abreast, but on June 25, 1946 it was decided to reduce seating to 52, increase fuel capacity by the addition of outer-wing bag tanks, and redesignate the Hermes III as the HP.79. Finally, in September 1946 it was resolved to develop a nosewheel version of the Hermes, the model with piston engines to be the HP.81 Hermes IV and that with turboprops the HP.82 Hermes V. Official approval for the building of the initial run of Hermes IVs and the prototype Hermes V was given on October 5, 1946.

The first Hermes V, registered G-ALEU, took off on its maiden flight from Radlett in Hertfordshire on August 23, 1949. Intended for trial purposes, the aircraft was unfurnished internally, but did have production-standard soundproofing. In external appearance the type was identical with the Hermes IV, apart from the nacelles and Theseus turboprops in place of the Hermes IV's Bristol Hercules 763 radials. Considerable trouble was experienced with the bifurcated jet pipes, but the Hermes V had the distinction of being the largest and fastest turboprop airliner of its day. Development continued, but was plagued by the never-ending series of problems with the Theseus engines. The aircraft was finally written off after a wheels-up landing on April 10, 1951.

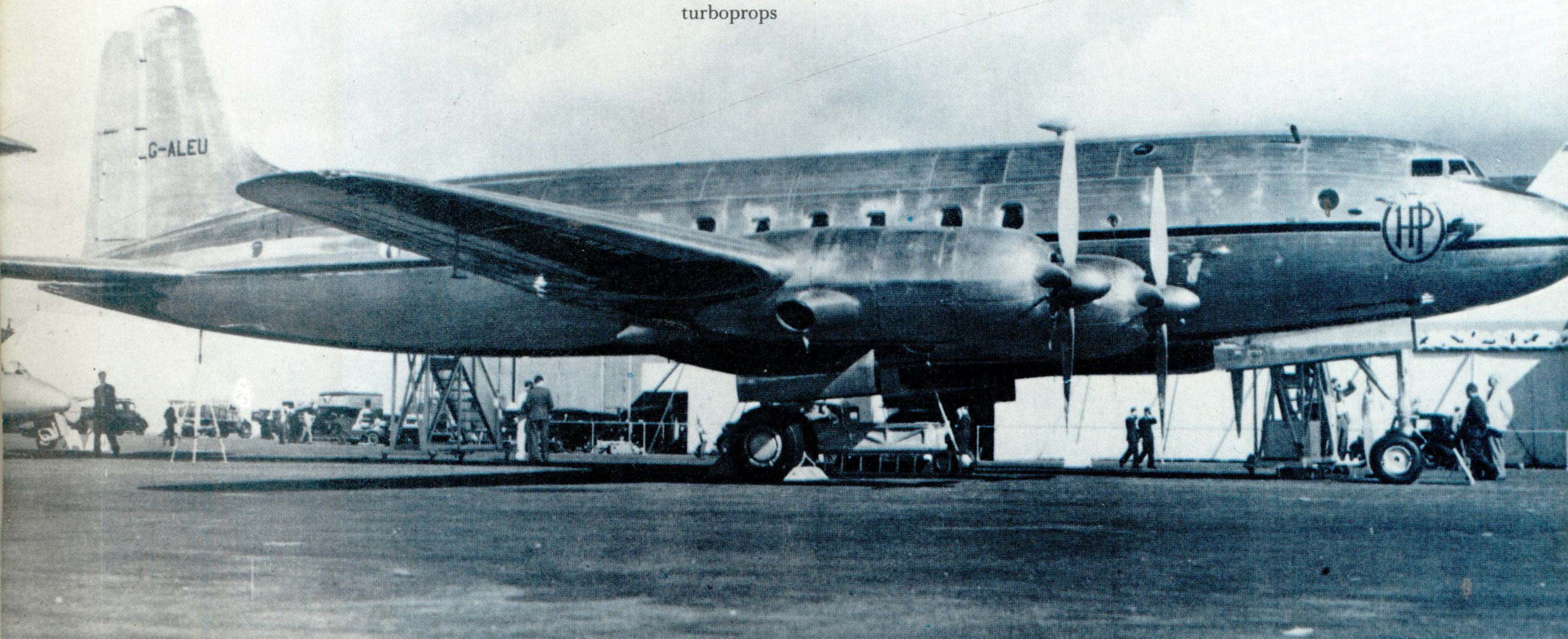
The only other Hermes V (G-ALEV) first flew on December 6, 1950 and had a similar test career until grounded as a fatigue-test airframe at Farnborough in September 1953.



HP.82 Hermes

Type: medium- and long-range transport
Maker: Handley Page Ltd
Span: 36.6 m (113 ft)
Length: 29.55 m (96 ft 10 in)
Height: 9.14 m (30 ft)
Wing area: 131.6 m^2 (1408 sq ft)
Weight: maximum 38 566 kg (85 000 lb); empty 23 088 kg (50 900 lb)
Powerplant: four 2490-hp Bristol Theseus 502 turboprops
Performance: maximum speed 565 km/h (351 mph); range 4023 km (2500 miles)
Payload: seats for up to 74 passengers
Crew: 7
Production: 2

Below: G-ALEU, the first prototype HP.82 Hermes V, at Farnborough in September 1949



Mamba-Marathon, Handley Page

FIRST FLIGHT 1946

THE development of the Handley Page Mamba-Marathon owes a lot, to the celebrated Brabazon Committee. During its 1943 deliberations about the type of aircraft which would be needed by a renascent British civil aviation industry, the Brabazon Committee had formulated the concept for a twin-engined feederliner to replace the DH.84 Dragon and DH.89 Dragon Rapide.

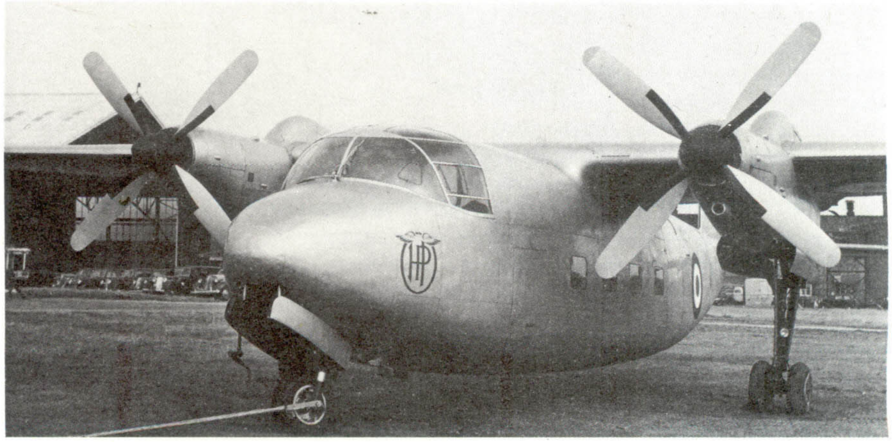
This requirement emerged as the Type 5, but in 1944 pressure from Miles Aircraft Limited resulted in a slight recasting of the requirement to include four-engined aircraft. After specification C.18/44 had been issued in the spring of 1944 to cover a high-wing monoplane able to carry 14 passengers on routes with small, inaccessible airfields on the power of four 330-hp de Havilland Gipsy Queen inline piston engines, the Miles M.60 Marathon was adopted as the Brabazon Committee Type 5A, and the DH.104 Dove as the Type 5B.

The Marathon was intended for use by both the BOAC and BEA, though the latter was also interested in a turboprop-powered derivative. Specification C.15/46 had accordingly been issued on May 19, 1947, resulting in the M.69 Marathon II.

By this time the Miles concern was in deep financial trouble, and on July 5, 1948, Handley Page, seeking a means to stay in the airliner business after the HP.86's failure against the Bristol Type 175 (Britannia), bought out Miles, whose Marathon was momentarily expected to be ordered into production, to the tune of some 50 aircraft. Handley Page also inherited the Marathon II, of which the single prototype was rapidly approaching completion at that time.

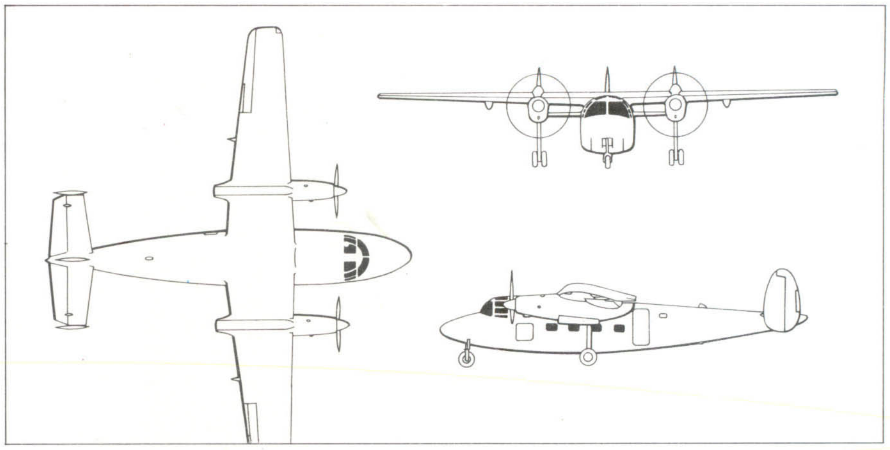
The Marathon II first flew on July 21, 1949 and almost ended its career on that same date: the left undercarriage leg refused to come down as the pilot prepared to land, and it was only very skilful flying that finally persuaded the leg to drop. The BEA trials of the aircraft were short: the Mamba-powered aircraft was more noisy than the Gipsy Queen-engined variant, and in early 1950 BEA cancelled its order for the type. The Mamba-Marathon was then used for experimental and racing work before being taken over by the Ministry of Supply early in 1951 as a test aircraft for de Havilland Propellers. In 1953 this sole example of its kind was converted into a testbed for the Alvis Leonides Major radial piston engine.

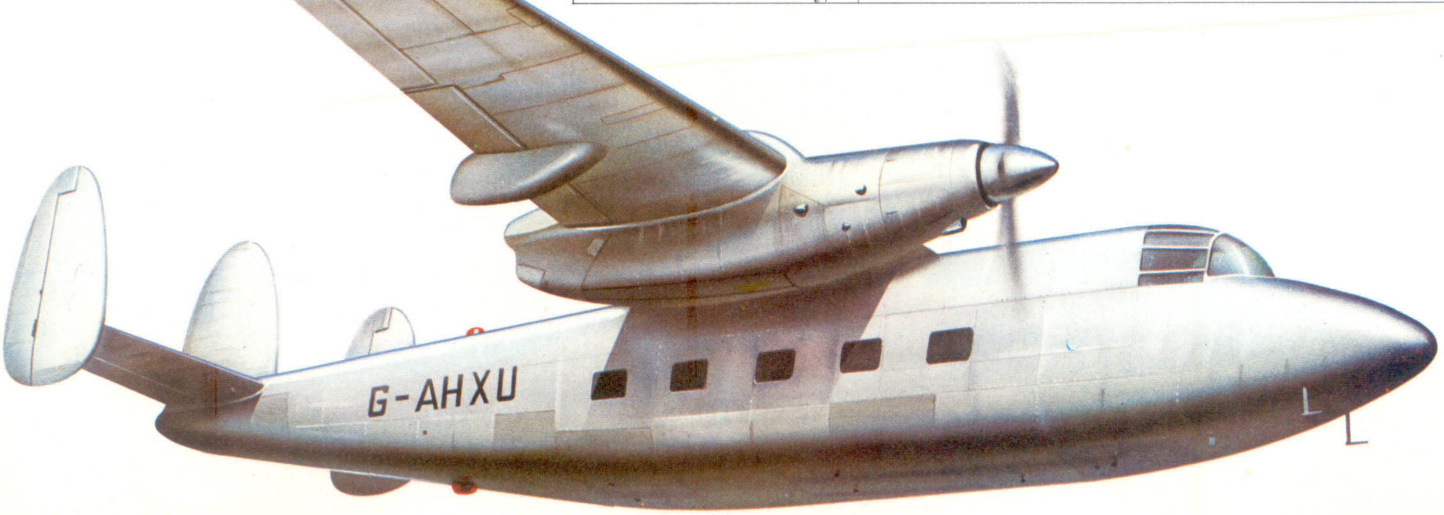
Below: The Mamba-Marathon 2 in Ministry of Supply markings
Bottom: The Mamba-Marathon, which was eventually broken up at Bitteswell in October 1959



HPR.1 Marathon II

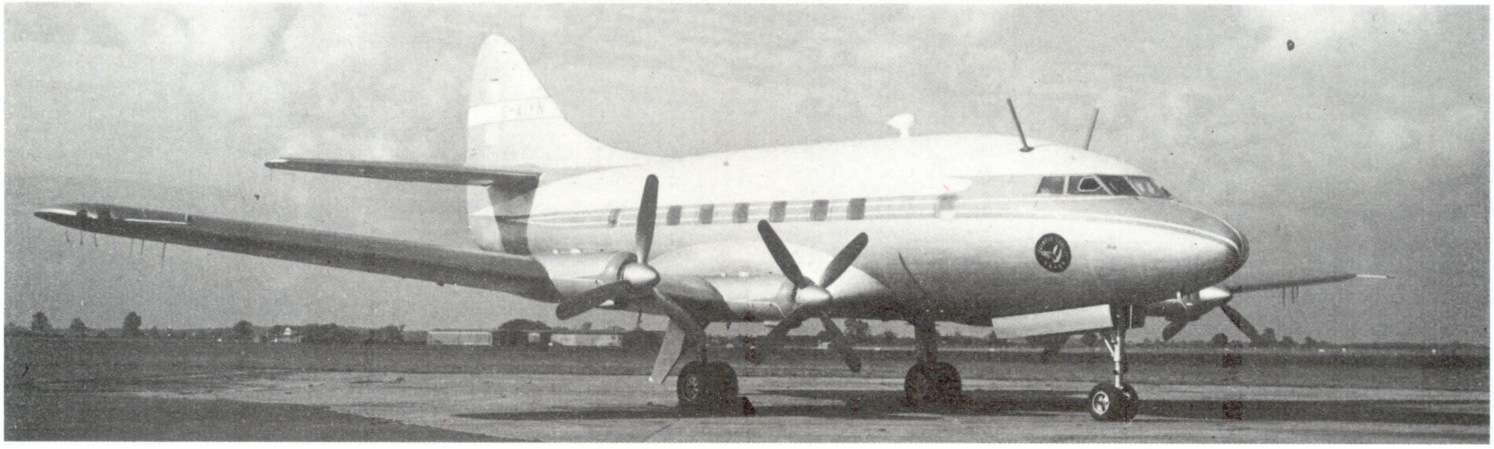
Type: short-range transport
Maker: Handley Page (Reading) Ltd
Span: 19.84 m (65 ft)
Length: 15.93 m (52 ft 3 in)
Height: 4.32 m (14 ft 2 in)
Wing area: 46.4 m^2 (498 sq ft)
Weight: maximum 8165 kg (18 000 lb); empty 4922 kg (10 850 lb)
Powerplant: two 1010-shp Armstrong Siddeley Mamba turboprops
Performance: cruising speed 418 km/h (260 mph); range 1448 km (900 miles)
Payload: seats for up to 18 passengers
Crew: 2
Production: 1





Apollo, Armstrong Whitworth

FIRST FLIGHT 1949

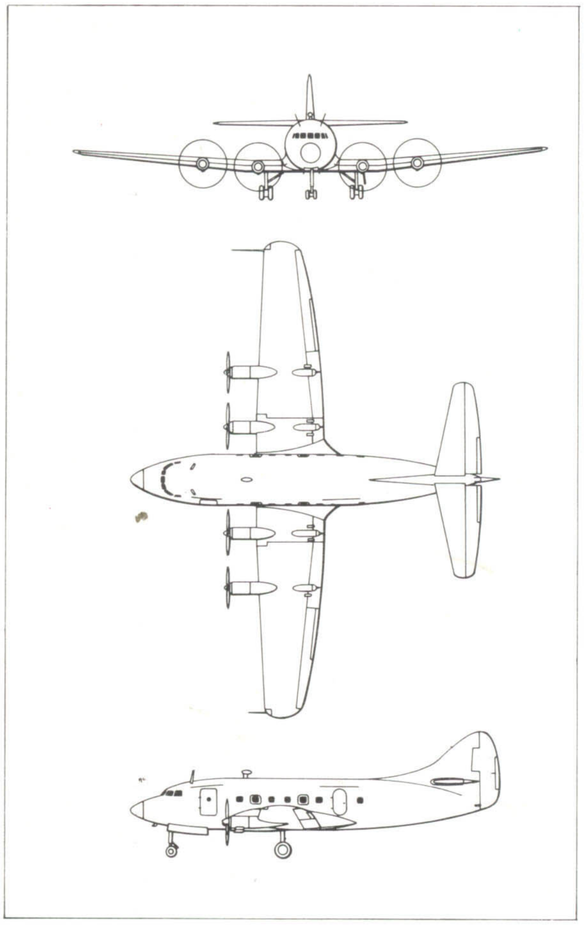


THE Armstrong Whitworth AW.55 Apollo was designed as a competitor to the Vickers Viscount in response to the requirement outlined in the wartime Brabazon Committee's Type II civil transport. It was a short- and medium-range airliner intended for operations in Europe.

Specification C.16/46 to which the Apollo was designed, called for a turboprop-powered airliner to carry between 24 and 30 passengers over a range of 1609 km (1000 miles) at 483 km/h (300 mph). The engine selected was the axial-flow Armstrong Siddeley Mamba, which had the advantage of commendably low frontal area compared with contemporary centrifugal-flow turboprops. However, it was of a basic type still in its design infancy, and so prone to severe teething problems. A clear example of this is seen in the case of the Mamba: in the form first used on the Apollo, the engine should have developed 1010 shp plus 139-kg (307-lb) thrust, whereas it developed only 800 shp.

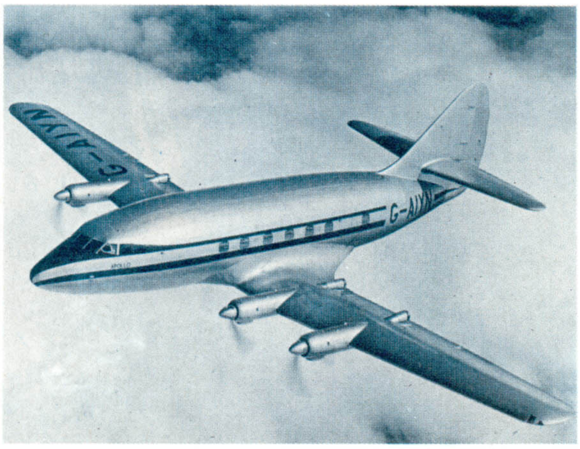
Right from the beginning of the design, the AW.55 (first named Achilles and Avon before finally becoming Apollo) had a span of 28.04 m (92 ft), but length was increased from 19.66 m (64 ft 6 in) to 20.73 m (68 ft) and at the production stage to 21.79 m (71 ft 6 in), providing accommodation for between 26 and 31 passengers seated two-abreast on each side of a central aisle.

Construction began in 1948 of two flying prototypes and a fuselage for static testing. The first prototype was given the Ministry of Supply serial VX220, and made its initial flight on April 10, 1949. Right from the beginning there were severe problems with the Mamba engines' power output and reliability, and the aircraft itself lacked longitudinal and directional stability. The control problems were remedied without undue difficulty, and the first prototype, re-registered G-AIYN, was available from October 30, 1950 for proving flights, starting with a successful flight to Paris on March 12, 1951. Finally, in July 1951, Mamba Mk 504 engines became available, but even these had severe limitations and problems. This proved the last straw, and in June 1952 further development was halted. The second prototype was subsequently completed, and both aircraft were used for a variety of experimental work for the Ministry of Supply, which had funded them. Both aircraft ended their flying lives in December 1954 when they became structural-test airframes.



AW.55 Apollo

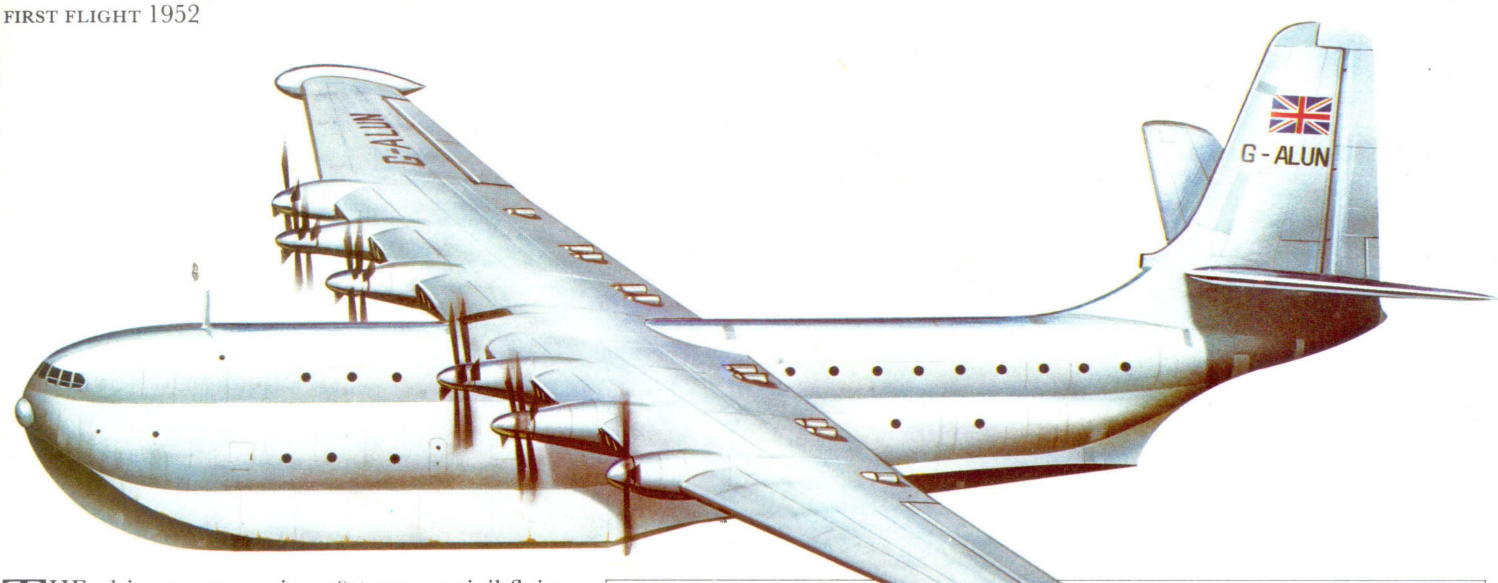
Type: medium-range transport
Maker: Armstrong Whitworth Aircraft
Span: 28.04 m (92 ft)
Length: 21.79 m (71 ft 6 in)
Height: 7.92 m (26 ft)
Wing area: 91.6 m^2 (986 sq ft)
Weight: maximum 20 412 kg (45 000 lb); empty 13 791 kg (30 800 lb)
Powerplant: four 1010-shp Armstrong Siddeley Mamba Mk 504 turboprops
Performance: cruising speed 444 km/h (276 mph) at 6096 m (20 000 ft); range 1513 km (940 miles)
Payload: 3402 kg (7500 lb); seats for up to 31 passengers
Crew: 3
Production: 2



Left: The prototype Apollo in the early months of 1950 when it suffered problems with its engines and stability Top: The same prototype in new livery with four-bladed propellers on the inboard engines and an increased tailplane span and fin area to compensate for its earlier stability problems

Princess, Saro

FIRST FLIGHT 1952



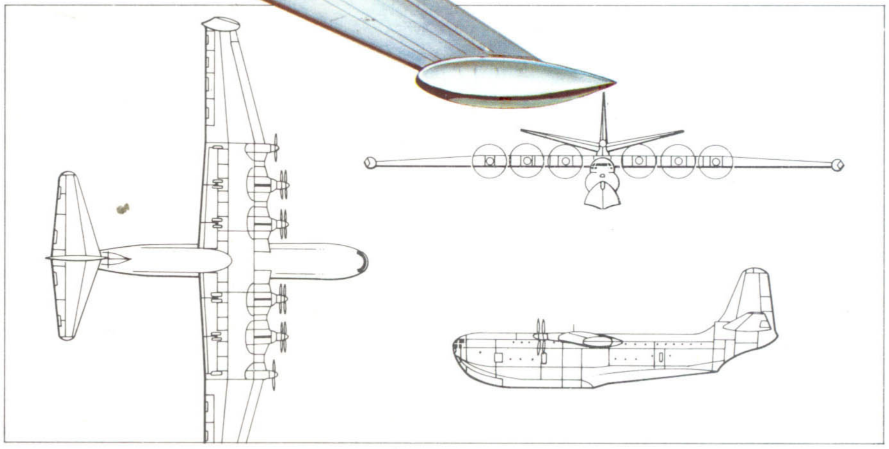
THE ultimate expression of the large civil flying boat concept, the Saunders-Roe SR.45 Princess marks a vital stage in the development of turboprop-powered airliners, combined with an obsolescent notion of the air travel requirements of the world in the aftermath of World War II. The origins of this huge aircraft lie in the days leading up to World War II, when Saunders-Roe built the A.37, a scaled-down flying model of a projected maritime-reconnaissance flying boat with an anticipated all-up weight of 83 462 kg (184 000 lb). The design ultimately bore fruit in the Short/Saunders-Roe Shetland reconnaissance flying boat, with a gross weight of 56 700 kg (125 000 lb).

At the end of World War II, however, the possibility of using high-power turboprop engines led Saunders-Roe to revive its interest in giant flying boats, this time as long-range passenger transports. This coincided with renewed official interest in the type, and in July 1945 Saunders-Roe was asked to tender for such an aircraft, which so suited the needs of the British Overseas Airways Corporation that in January 1946 the airline asked the Ministry of Supply to order three examples.

The order was placed in May 1946, and subject to final revision with Bristol Proteus turboprops after the cancellation of the Rolls-Royce Tweed programme, was named Princess, after the name Dollar Princess had been considered and rejected.

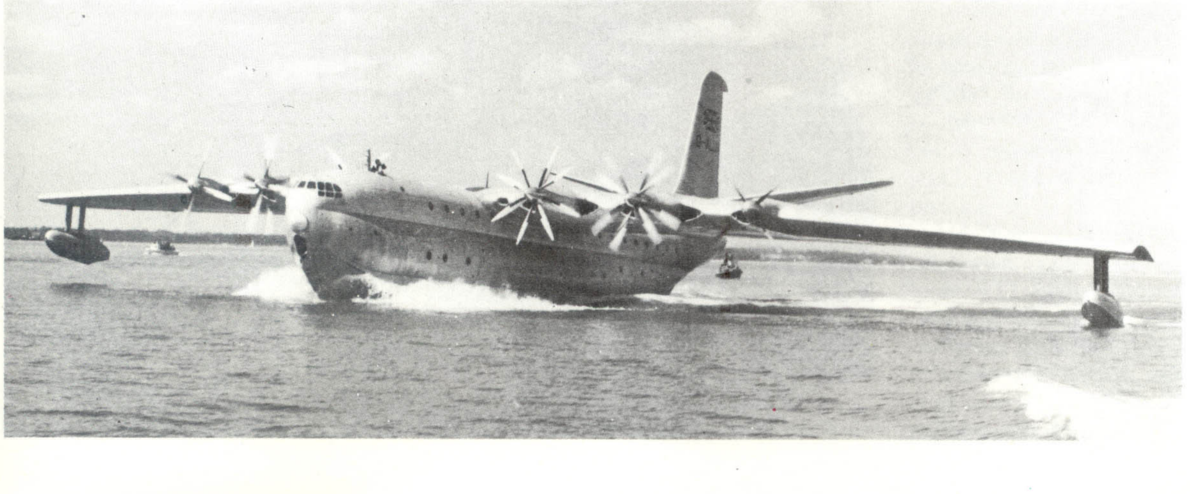
Of relatively conventional flying boat layout, the Princess was powered by ten Bristol Proteus turboprops, each rated at 3200 shp with 363-kg (800-lb) thrust. Eight of the engines were mounted in pairs driving contra-rotating propellers 5.64 m (18 ft 6 in) in diameter, and the last two units were mounted singly in the outboard of the three nacelles in each wing. Some 65 916 litres (14 500 Imp gal) of fuel would give the Princess a range of 8851 km (5500 miles), it was hoped. The fuselage was of the 'double-bubble' type, the upper lobe being pressurized to ensure the comfort of the passengers, who were provided with a bar, bunks, and several lavatories and powder rooms.

The building programme was slow, and it was not until August 20, 1952 that the first Princess was launched, taking to the air two days later. Flight trials revealed serious problems with the gearboxes for the contra-rotating propellers, however, and BOAC cancelled its order.



SR.45 Princess

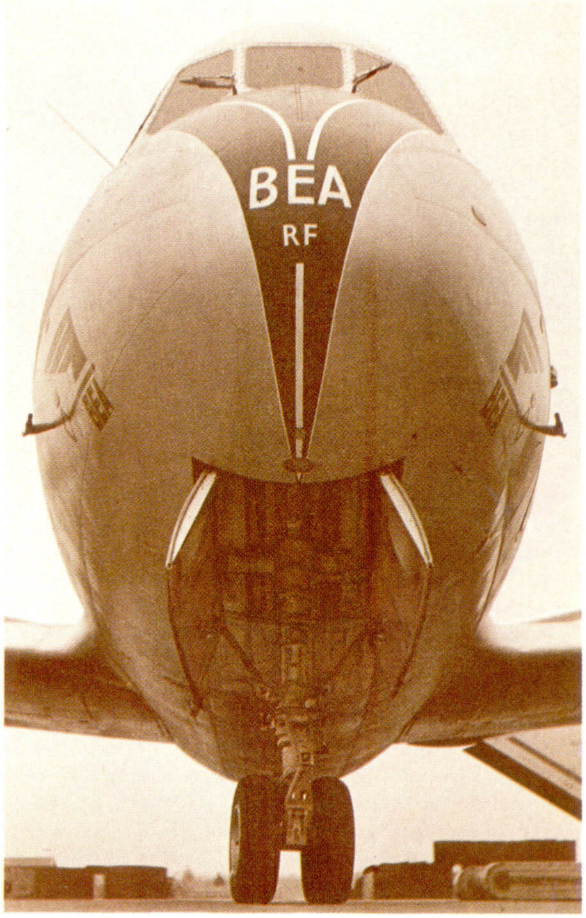
Type: long-range transport flying boat
Maker: Saunders-Roe Ltd
Span: 66.9 m (219 ft 6 in)
Length: 45.11 m (148 ft)
Height: 17.38 m (57 ft)
Wing area: 466.28 m^2 (5019 sq ft)
Weight: maximum 149 687 kg (330 000 lb); empty not available
Powerplant: ten 3200-shp Bristol Proteus 600 turboprops
Performance: maximum cruising speed 612 km/h (380 mph) at 11 278 m (37 000 ft); range 8851 km (5500 miles)
Payload: generally seats for up to 105 passengers
Production: 3



Top and left: G-ALUN, the only SR.45 Princess to fly. It was powered by ten Proteus 600 series turboprops, eight paired in the inner four nacelles, with two single engines in the outers

Viscount, Vickers-Armstrongs

FIRST FLIGHT 1948



THE origin of the Viscount lay in the 1944 discussions between the members of the Brabazon Committee and the designers of Vickers-Armstrongs on the possibility of developing a turboprop transport for European operations.

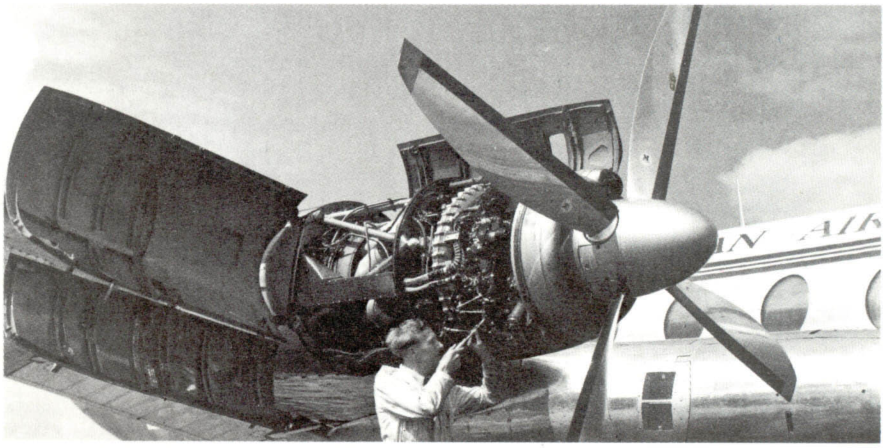
Vickers was already working on the VC1 Viking, a civil transport derived in part from the Wellington bomber, but was more than interested in a possible successor to the type, powered by turboprop engines. Resulting from deliberations between the industry and the committee, therefore, requirements were drawn up for two high-speed transports intended for European routes. The Brabazon IIA resulted in the piston-engined Airspeed Ambassador, while the Brabazon IIB led to the turboprop Vickers VC2 Viscount.

Three concepts for a Brabazon IIB were presented to the committee and the Ministry of Aircraft Production, the choice finally being made in April 1945 of a pressurized model capable of carrying 24 passengers or a payload of 3402 kg (7500 lb) at a speed of 478 km/h (297 mph) at 6096 m (20 000 ft) over a range of 1674 km (1040 miles) on the power of four Rolls-Royce Dart turboprops each rated at 1130 ehp. Designated Type 453 by the company, the aircraft was the design of Rex Pierson assisted by George Edwards. Two prototypes, detailed in specification C.8/46 of April 17, 1946, were ordered on March 9, 1946. This specification reduced the required range to 1127 km (700 miles) and the speed to 444 km/h (276 mph). The name envisaged for what was now the Type 609 was Viceroy. This was changed to Viscount after the partition of India in 1947.

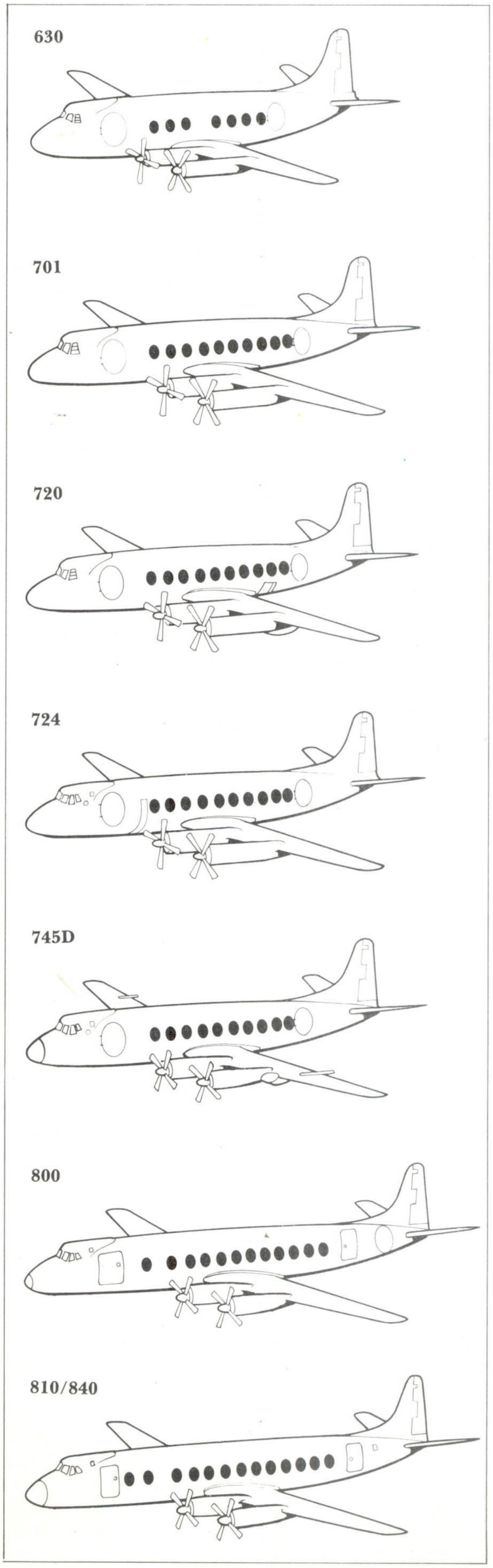
Production of the two prototypes for the Ministry of Supply began in December 1946, as did work on a third prototype, funded by Vickers. By this time the ministry called for Armstrong Siddeley Mamba engines and a fuselage stretch of 2.74 m (9 ft) to raise passenger capacity to 32, a figure specified by the newly formed British European Airways. The Dart engine, temporarily superseded in official favour by the promising Mamba, was reinstated on August 27, 1947 and it was four RDa. 1 engines which powered the prototype when it first flew on July 16, 1948 as the Type 630.

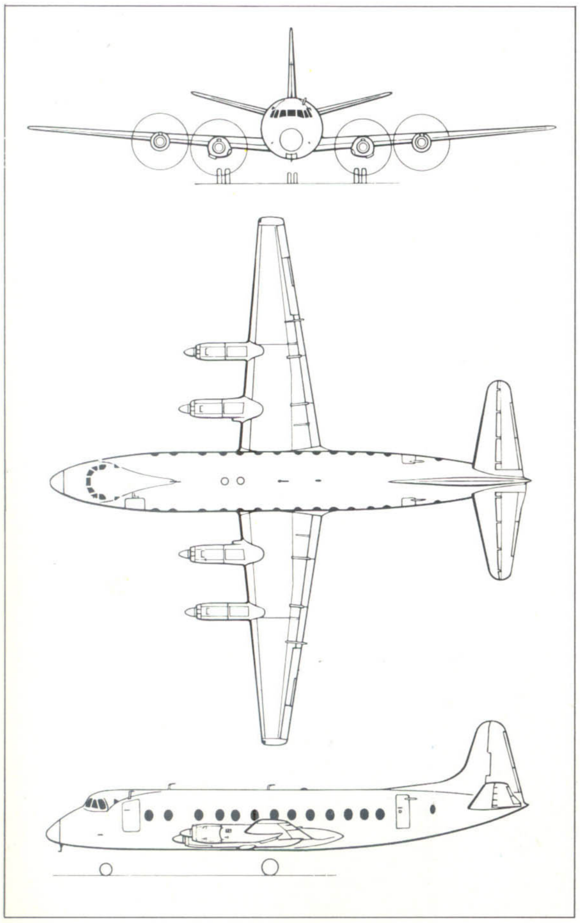
Already, though, official and airline interest in the Viscount had waned in favour of the Airspeed Ambassador. The situation was remedied by the

Top left: Close-up of the nose of the prototype Vickers Viscount 630 showing the last two letters of its designation G-AHRF. It was assembled at Foxwarren and flew at Wisley in July 1948
Above: The Viscount became one of the mainstays of medium-range airlines in the 1950s and 1960s
Below: The Dart 506 or 510 series engines were installed in beautifully engineered powerplants with four cowl panels arranged in two hinged groups. Rotol supplied the propellers



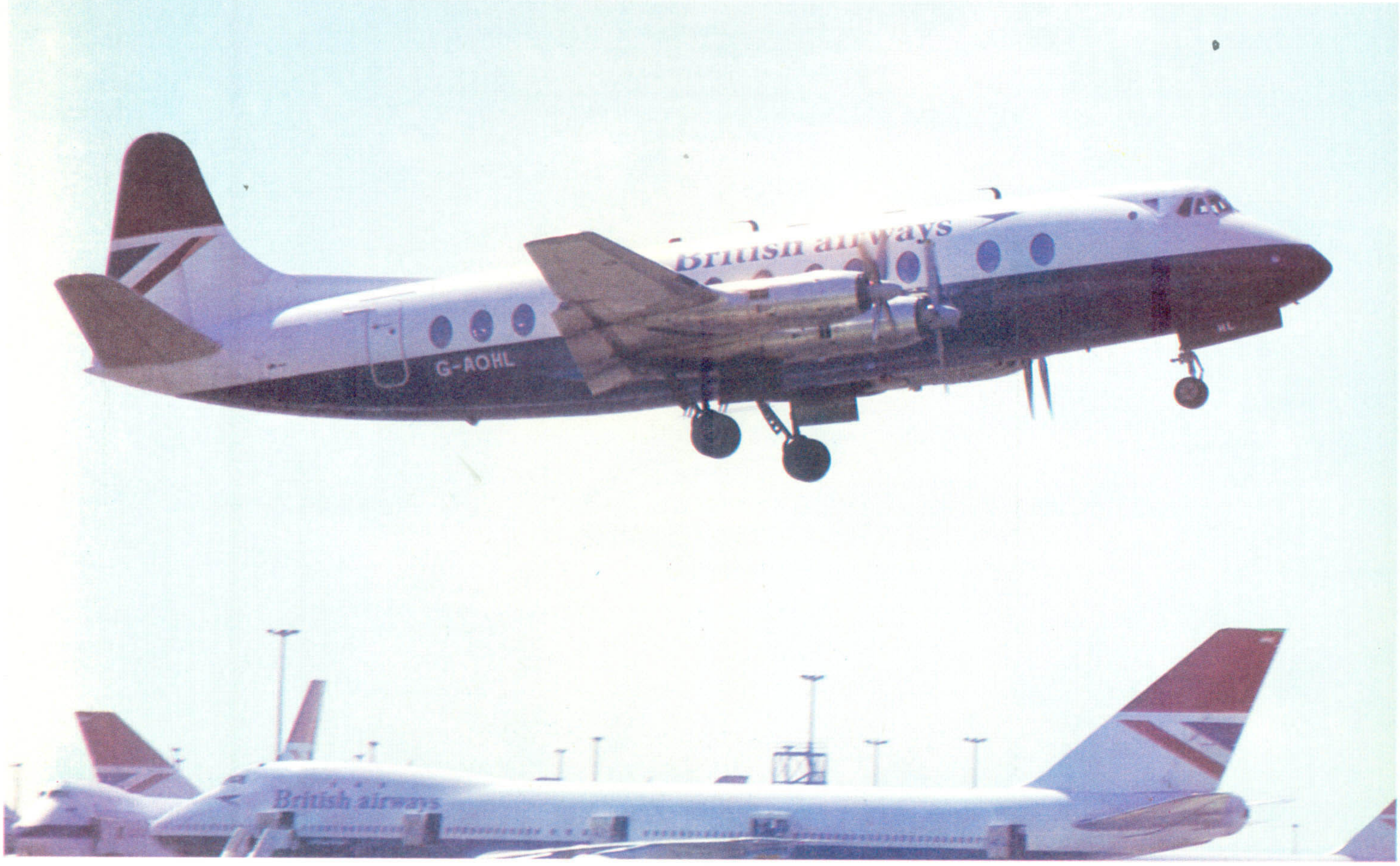
Right: The willingness of Vickers-Armstrongs to custom-build for an airline helps to explain the large number of Viscount sub-types. Starting with the V.630 prototype it was 'stretched' several times, with steadiy increasing gross weight





Viscount, Type 810

Type: short- and medium-range transport
Maker: Vickers-Armstrongs Aircraft Ltd
Span: 28.56 m (93 ft 8½ in)
Length: 26.11 m (85 ft 8 in)
Height: 8.15 m (26 ft 9 in)
Wing area: 89.47 m^2 (963 sq ft)
Weight: maximum 32 886 kg (72 500 lb); empty 19 731 kg (43 500 lb)
Powerplant: four 1990-ehp Rolls-Royce Dart RDa. 7/1 Mk 525 turboprops
Performance: maximum cruising speed 575 km/h (357 mph) at 6096 m (20 000 ft); range with maximum payload 2554 km (1587 miles)
Payload: 6350 kg (14 000 lb); seats for up to 65 passengers
Crew: 5
Production: 445 (all types)

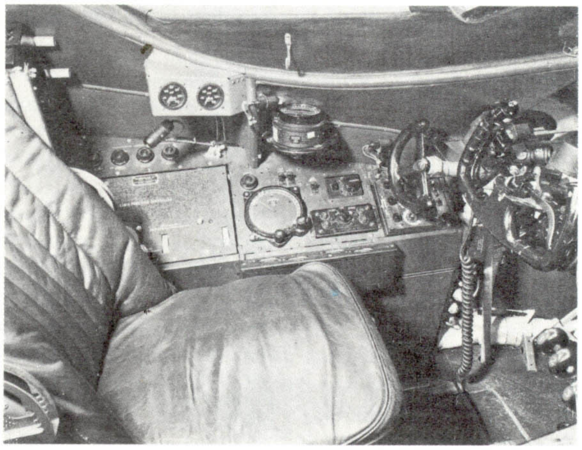


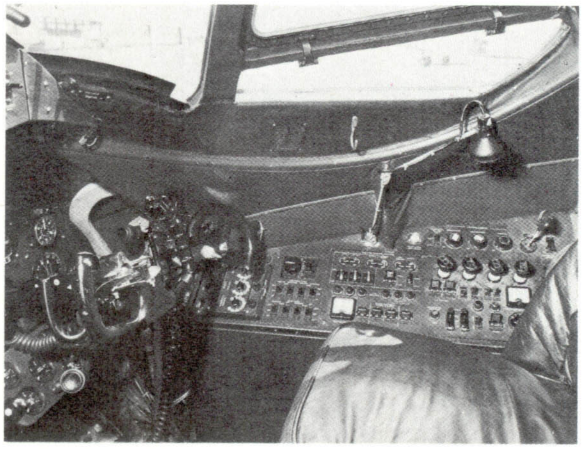
appearance of the RDa. 3: with 40% more power available, Vickers could increase span by 1.52 m (5 ft) and length by 2.24 m (7 ft 4 in) to produce the 53-passenger Type 700, which could cruise at 536 km/h (333 mph) on its four 1550-ehp RDa. 3s. The Ministry of Supply ordered the prototype of such a model on February 24, 1949, this machine first flying on August 28, 1950. The performance of the Type 700, capable of cruising with 53 passengers at 499 km/h (310 mph), considerably impressed BEA, which had already flown fare-paying services between London and Paris with the Vickers-owned Type 630. On August 3, 1950, therefore, BEA ordered 20 Type 701s, improved Type 700s for which the order was later raised to 26.

The first of these aircraft was delivered on January 3, 1953 and after receiving its certificate of airworthiness on April 17, 1953, began the world's first turboprop-powered scheduled service on the next day, some eight years after the Brabazon Committee's requirement had been formulated.

The success of the new type was confirmed by a number of important orders, notably from Trans-Canada Air Lines for 15 Type 724s in November 1952, and from Capital Airlines for 40 Type 745s in August 1954.

Major design variants were the Types 724 (new fuel system, two-pilot cockpit and increased weight), 745 (RDa. 6 Mk 510 engines and increased weight), 800 (fuselage stretched by 1.17 m [3 ft 10 in] to accommodate 71 passengers) and 810 (RDa. 7/1 engines, structural strengthening and increased weight)





Above: G-AOHL *Charles Sturt*, a Vickers V.802 Viscount which first flew in 1957
Left: The left-hand side panel of the cockpit
Below: The right-hand side panel of the cockpit

Tu-114, Tupolev

FIRST FLIGHT 1956

THE Tupolev Tu-114 long-range airliner was developed in parallel with the Tu-95 (Tu-20) heavy bomber. Among the many distinctions of the Tu-114 is the fact that it was the world's fastest propeller-driven transport, and with the Tu-95 the world's only all-swept propeller-driven aircraft.

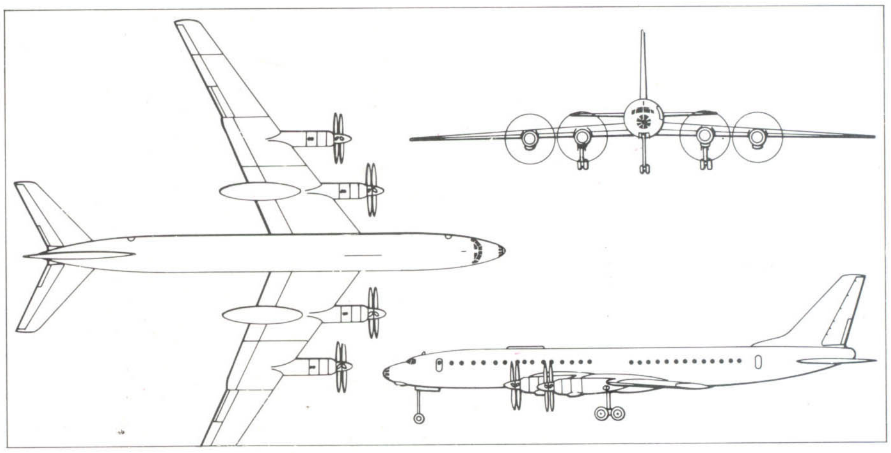
Early details of the Tu-114 are sparse, but it seems that the prototype completed its flight test programme in 1956, the powerplant at this time comprising four 12 000-ehp Kuznetsov NK-12M turboprops developed by a team under N D Kuznetsov from an unsuccessful unit produced by 'liberated' German engineers at Kuybyshev on the basis of the wartime Junkers Jumo 012. On production aircraft the engines were fully developed NK-12MVs, each with a higher rating and driving four-blade contrarotating propellers.

Accommodation options were wide, thanks to the provision of three main cabins and four smaller cabins. For continental operations the seating was normally for 170 passengers basically six-abreast; for intercontinental operations normal accommodation was between 100 and 120; and for shorter-range flights up to 220 passengers could be carried in seven- or eight-abreast seating. The cabins, were furnished in a somewhat old-fashioned way, with brass lamps and luggage racks.

The Tu-114, called *Rossiya*, was intended as a replacement for the Ilyushin Il-14 twin-engined medium-range airliner on Aeroflot's longer routes, and the new aircraft's capabilities were well demonstrated by a number of records set up in 1960 and 1961 with NK-12M engines. Considerable trouble was experienced with engine overheating and fires, however, and the Tu-114 did not enter scheduled service until April 1961, autumn 1959 having been the target.

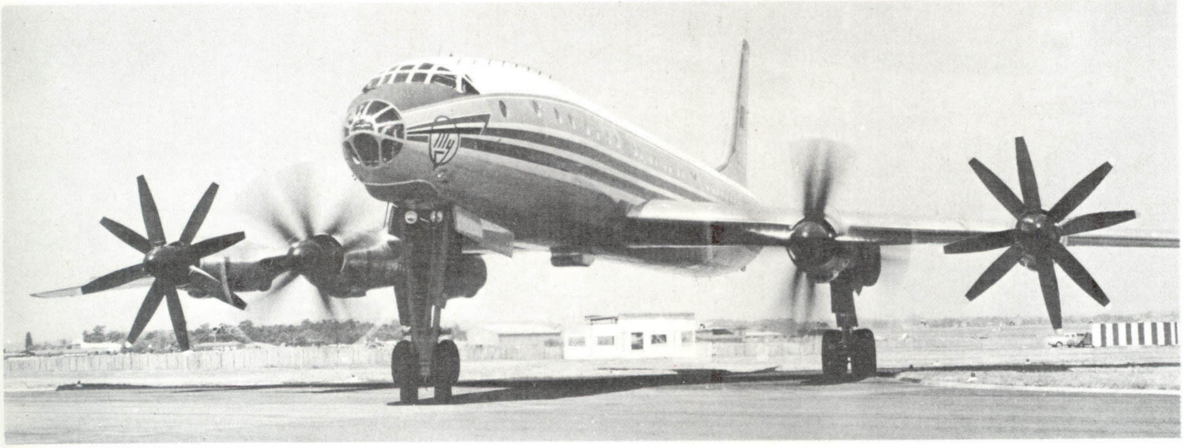
Aeroflot's routes and the emergence of pure jet airliners had by this time reduced the need for the Tu-114, hence restricting the numbers built. The only variant of the type was the Tu-114D, probably a demilitarized Tu-95 with a few windows and intended for urgent flights over very long ranges.

Retired from airline service in October 1976, the Tu-114 has since been given a new lease of life by transformation into the Tu-126 'Moss' airborne warning and control system (AWACS) aircraft, with a large radar scanner in a rotodome above the fuselage.



Tu-114

Type: long-range transport
Maker: Tupolev Design Bureau
Span: 51.1 m (167 ft 8 in)
Length: 54.1 m (177 ft 6 in)
Height: 13.1 m (43 ft)
Wing area: 311.1 m^2 (3349 sq ft)
Weight: maximum 175 000 kg (385 802 lb); empty 93 000 kg (205 026 lb)
Powerplant: four 15 000-ehp Kuznetsov NK-12MV turboprops
Performance: cruising speed 770 km/h (478 mph) at 9000 m (29 528 ft); range with a payload of 15 000 kg (33 069 lb) and reserves 8950 km (5561 miles)
Payload: 30 000 lb (66 138 lb); seats for up to 220 passengers
Crew: 6
Production: approx 30



Left and below: The Tu-114 is the only major propeller-driven transport with a marked swept-back wing. Each four-blade unit of its vast contraprops could be pushed round independently by hand

Britannia, Bristol

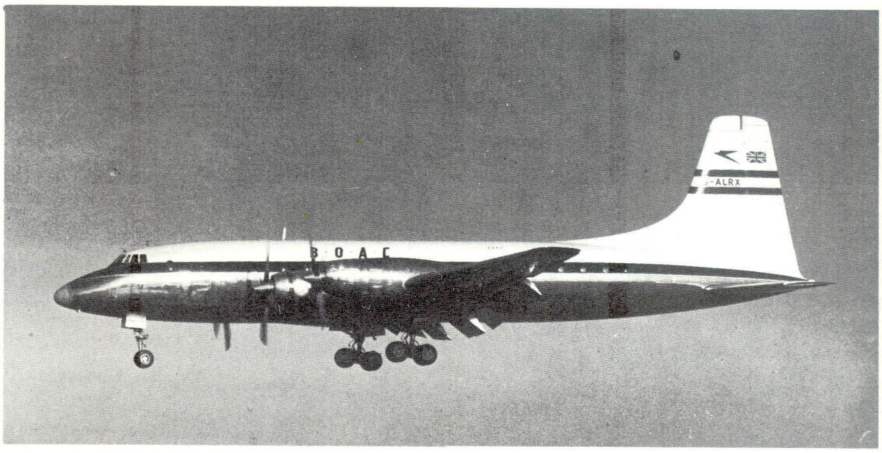
FIRST FLIGHT 1952

THE Britannia resulted from requirement C.2/47, issued by the Ministry of Supply on behalf of the British Overseas Airways Corporation, for a Medium-Range Empire airliner. Bristol had at first responded to a BOAC requirement of 1946 by proposing the Lockheed L.749 Constellation re-engined with Bristol Centaurus 660 radials, but Treasury refusal of such expenditure of US dollars led to the C.2/47 requirement. Eight designs proposed by five firms resulted, but only the Bristol Type 175 came anywhere near meeting the exacting specifications.

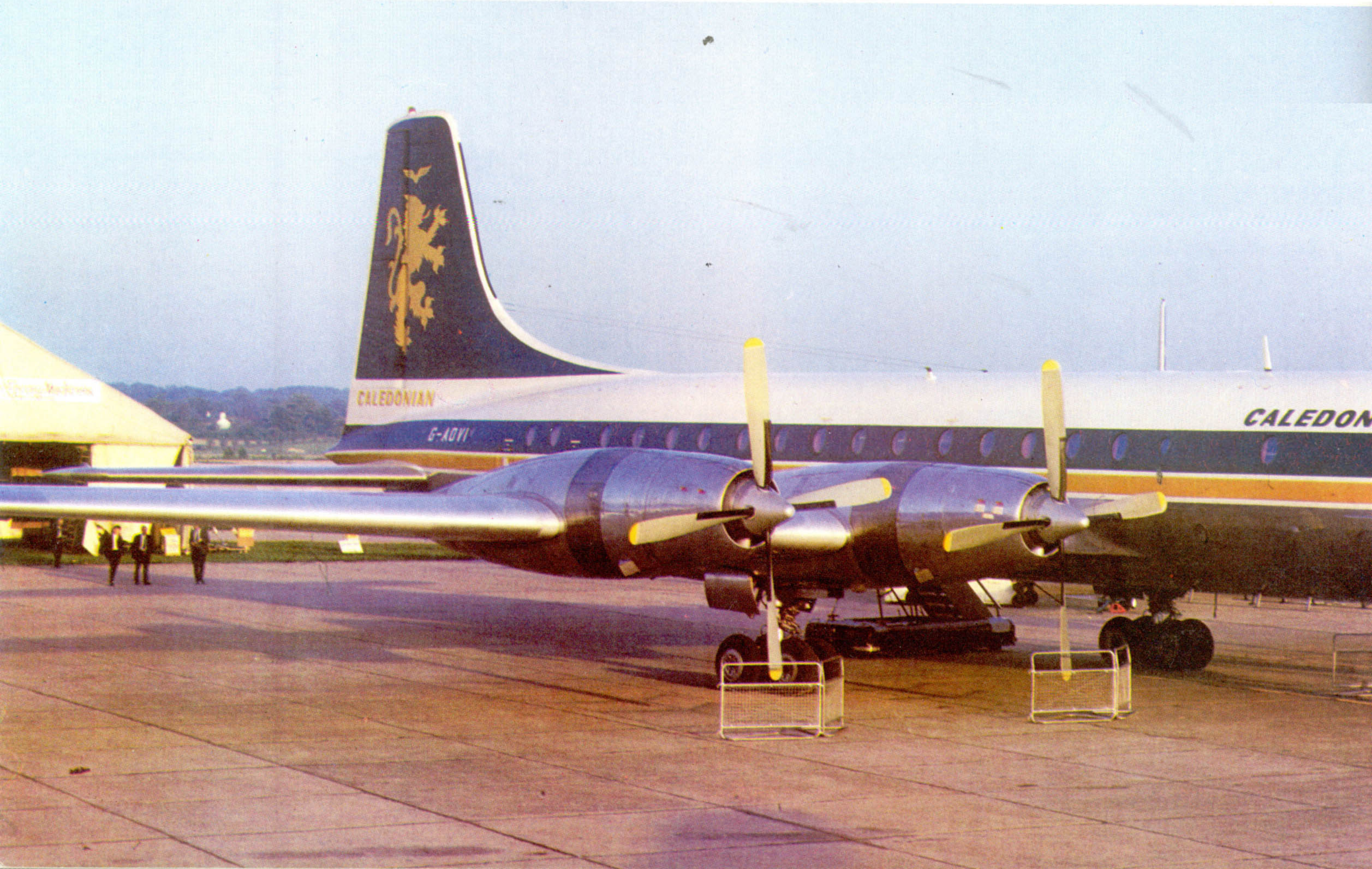
Consultations during October 1947 resulted in the design being fixed at a span of 39.62 m (130 ft); a payload of 48 passengers, luggage and 1529 kg (3370 lb) of freight; a gross weight of 46 857 kg (103 300 lb); and a speed of 499 km/h (310 mph) on the power of four Centaurus 662 radials. It was also considered whether or not Bristol Proteus turboprops or Napier Nomad compound engines might be fitted, but Bristol would not guarantee the type's performance with the alternative engines. Financial wranglings between the Ministry and the airline followed, but on July 5, 1948 the Ministry of Supply ordered three prototypes. All were to have the Centaurus radial, though the second and third were to be convertible to Proteus turboprops, and the third was to be fitted out to full airline standards.

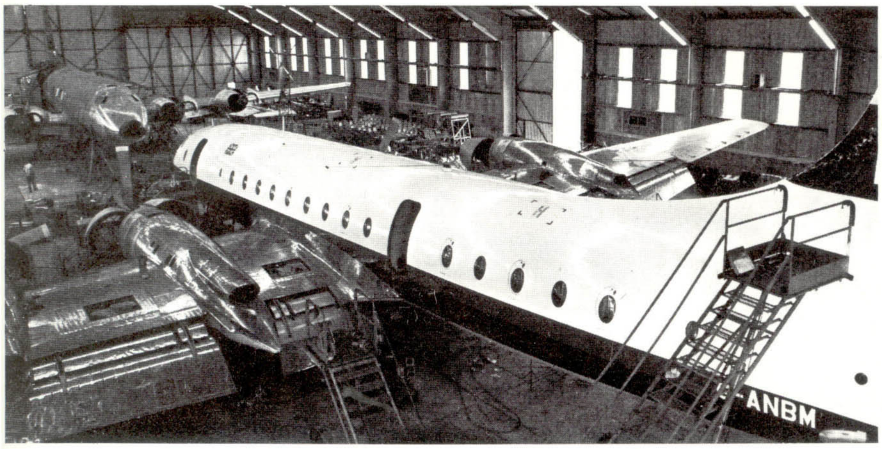
An entry-into-service date of 1954 was anticipated, but the project was thrown back into the melting pot in October 1948 when BOAC decided that the model engined with Proteus turboprops merited more attention. The result was a design suitable for African and Far Eastern routes, to be engined with either Proteus or Centaurus engines. BOAC agreed to buy 25, to operate initially with Centaurus but later with Proteus engines, the contract being signed only on July 28, 1949.

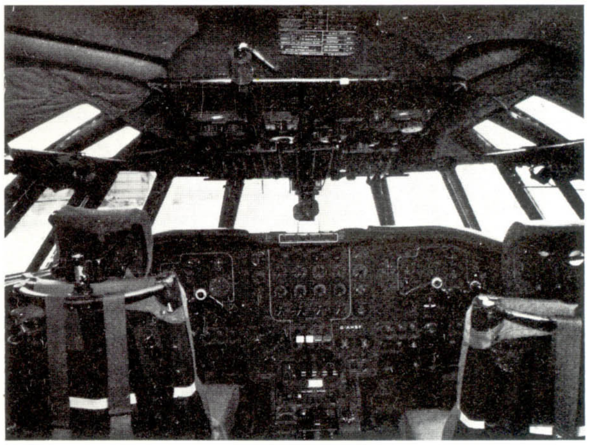
The delay before signature gave Bristol yet more time for reflection, this time centred on the possibility of upgrading the basic design for transatlantic operations with extra fuel, a maximum weight of 58 968 kg (130 000 lb), a payload of 10 660 kg (23 500 lb) including 83 passengers, and four-wheel main bogies instead of two-wheel units. Either Centaurus or Proteus engines were possible, though the success of the Proteus 3 in 1950 led to the abandonment of the Centaurus concept even in



Above: A Britannia Series 101 comes in to land at Filton, Bristol. This aircraft was damaged beyond repair at Littleton-upon-Severn in 1954
Below: A Britannia Series 312 *County of Argyll* of Caledonian. It was withdrawn from service at Luton in 1972







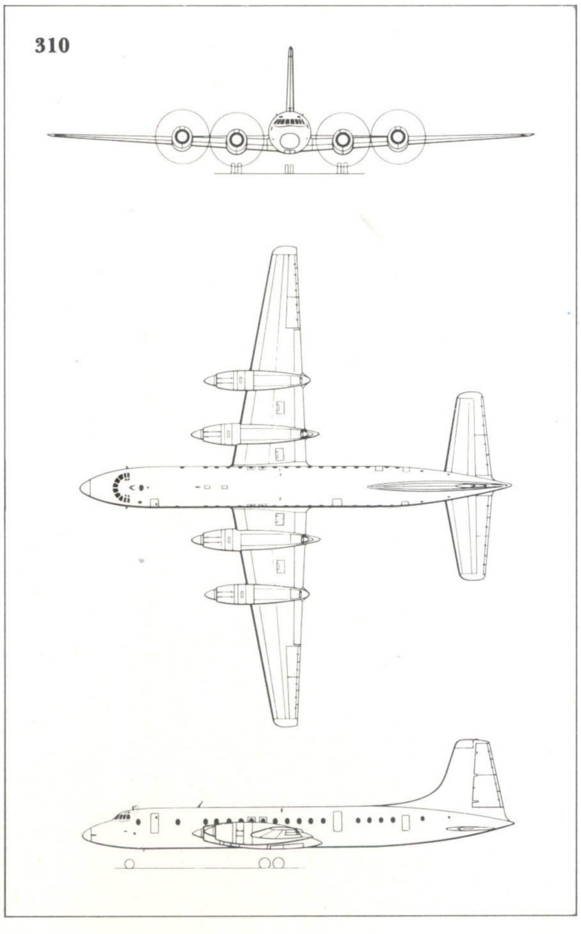
BOAC's strategy. Structural testing of a specimen wing and attached fuselage was so impressive that maximum take-off weights up to 63 504 kg (140 000 lb) became possible, with a consequent increase in fuel capacity.

The first prototype of what had by now become the 90-seat Britannia took to the air on August 16, 1952 under the power of four Proteus 625 engines in place of the proposed Proteus 705s. This engine was specified for the 15 Series 100 aircraft now to be bought by BOAC, but the first scheduled service flown by this original operator was delayed until February 1, 1957 as a result of a harrowing number of teething troubles with the Proteus turboprops, centred mostly on icing problems.

The Series 100 aircraft was followed by the project-only Series 200 all-cargo model with longer fuselage; the Series 250 long-fuselage mixed cargo/freight model for the Royal Air Force (23 aircraft); and finally, in May 1955, by the definitive long-range Series 300, whose fuselage was 3.12 m (10 ft 3 in) longer than that of the Series 100. All three long-fuselage models were cleared for take-off at 70 308 kg (155 000 lb), though this figure was increased as more powerful engines and outer-wing tankage were incorporated in the 310 series.

Total production of the Series 300 reached 45 aircraft, all of which proved highly successful in service. The early delays had caught up with the design, however, and the availability of the Series 300 was overshadowed by the appearance of the considerably faster long-range turbojet airliners.

Above left: The first Laker Britannia, G-ANBM, on overhaul at Prestwick. The aircraft was passed to an Indonesian operator in 1969 – 12 years after receiving a certificate of airworthiness
Above: The flight-deck of a Britannia 102 G-ANBF, which operated with BOAC and Britannia Airways

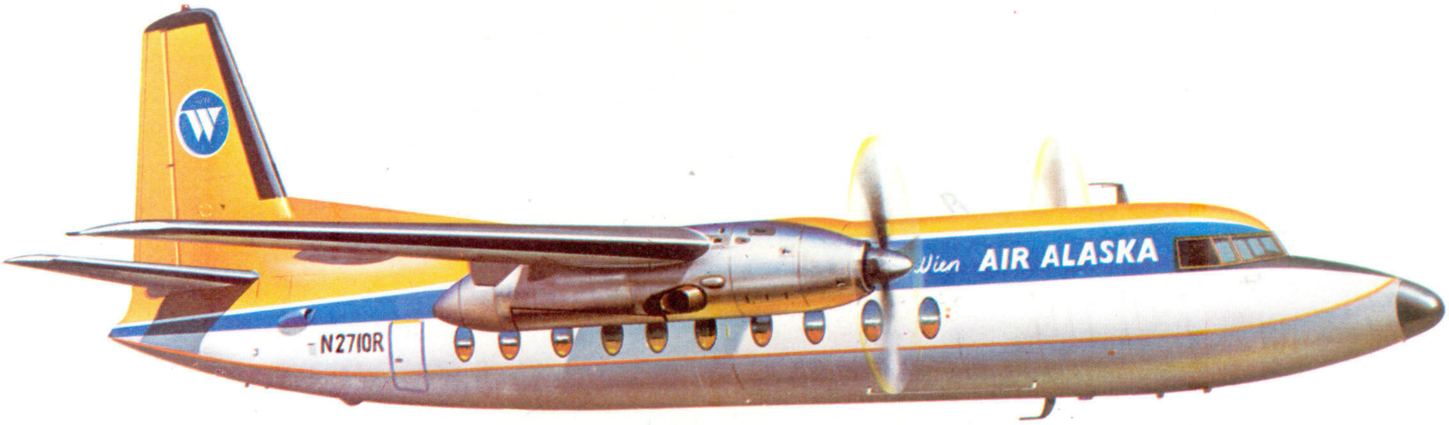


Britannia 311-319 Series

Type: long-range transport
Maker: Bristol Aircraft Ltd
Span: 43.36 m (142 ft 3 in)
Length: 37.87 m (124 ft 3 in)
Height: 11.43 m (37 ft 6 in)
Wing area: 192.77 m^2 (2075 sq ft)
Weight: maximum 83 915 kg (185 000 lb); empty 37 439 kg (82 537 lb)
Powerplant: four 4450-ehp Bristol Proteus 761 turboprops
Performance: cruising speed 575 km/h (357 mph) at 7925 m (26 000 ft); range with maximum payload 6868 km (4268 miles)
Payload: 15 831 kg (34 900 lb); seats for up to 139 passengers
Crew: 7
Production: 85 (all types)

F27 Friendship, Fokker

FIRST FLIGHT 1955



GIVEN the company's long association with the production of twin-engined medium-range airliners, it is hardly surprising that the first major civil aircraft developed by Fokker after World War II was such a type. While the British were developing their first turboprop-powered airliners against a relatively sated market, Fokker was building up a comprehensive picture of what most operators would like in the way of a DC-3/C-47 replacement from the mid 1950s onwards.

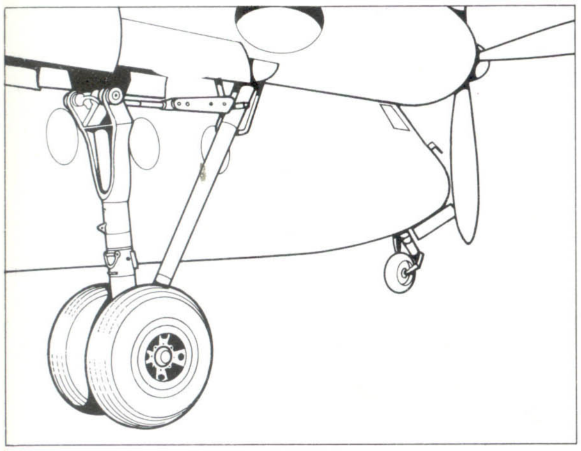
From this bank of information the Fokker designers came up with their P.275 concept during the late summer of 1950. The aircraft was to be a shoulder-wing machine with accommodation for up to 32 passengers and powered by a pair of Rolls-Royce Dart turboprops. From this idea emerged the F27, able to carry up to 40 passengers in pressurized comfort over a range 500 km (311 miles), and capable of operating from small airfields thanks to the provision of double-slotted flaps. Confident that the type was a potential best-seller, the Dutch government in 1953 funded the production of two flying and two test aircraft.

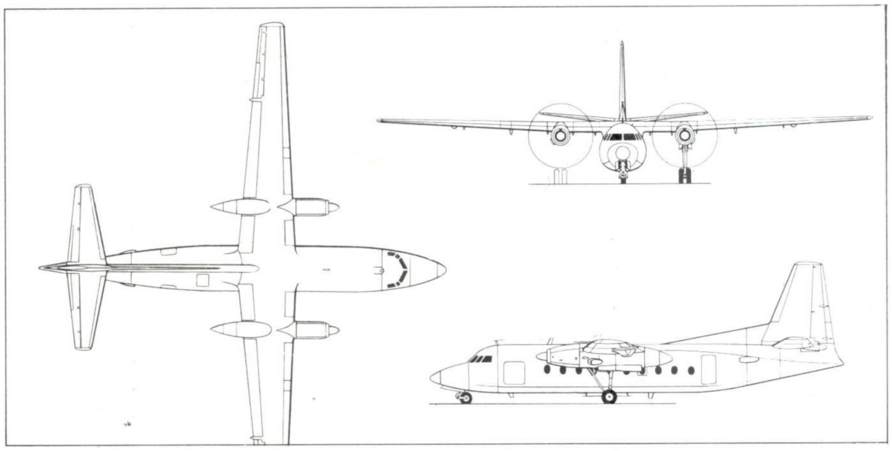
While construction of the prototypes was underway, the company launched an intensive sales effort, and this soon began to yield orders. The first prototype flew on November 24, 1955 and was immediately involved in an intensive flight trials programme. The second prototype, which flew on January 29, 1957, was typical of the production standard aircraft, with Dart 511 engines in place of the first prototype's Dart 507s, and the fuselage stretched by 0.91 m (3 ft) to seat 36 passengers in place of 32. In this guise maximum take-off weight was 16 193 kg (35 700 lb). Tests revealed that the double-slotted flaps were unnecessary for an adequate short-field performance, so less complex and costly single-slotted flaps were decided upon.

The local-operator interest generated by the F27, now named the Friendship, is indicated by the fact that Fairchild secured a licence-production agreement for the type in the United States. The first Fokker-built F27 flew on March 23, 1958, entering service with Aer Lingus in December of that year. The Dutch-built F27 was beaten into service, however, by the Fairchild F-27, which had a longer nose for weather radar, extra fuel tankage, American instrumentation and seating for up to 40 passengers. The first two American F-27s flew on

Above right: The F27 featured a very long-legged Dowty main landing gear which was, unusually, pneumatically operated. The twin-wheel main units retract backward into the engine nacelles

Above: An F27 of Wien Air Alaska; like many operators in the USA Wien Air Alaska was formed through amalgamations of smaller firms. Among these airlines was Alaska's oldest, Wien Alaska Airlines founded by Noel Wien in 1924





April 12 and May 23, 1958, and the aircraft received its Federal Aviation Administration Type Approval on July 16.

The F27 and F-27 were produced largely in parallel for some time, and the type is still in Dutch production as the world's best-selling turboprop airliner. The initial model was the F27 Mk 100/F-27, soon followed by the F27 Mk 200/F-27A with uprated Dart Mk 528s for higher speeds and better airfield performance, especially in 'hot and high' conditions, and take-off weights up to 20 412 kg (45 000 lb).

To meet airline requirements for a model able to operate as a freighter if necessary, there appeared in 1958 the F27 Mk 300/F-27B with a strengthened floor and large freight-loading door in the left side of the forward fuselage. The F27 Mk 400, and closely similar F27M Troopship, had Dart Mk 528 engines, and being intended mainly for military operators, had no Fairchild equivalent. There followed the F27 Mk 600, derived from the convertible Mk 300 and 400, but with improved RDa. 7 turboprops in place of the earlier RDa. 6s, and a simplified fuselage floor. The F27 Mk 700 was similar, but powered by RDa. 6 engines.

All the models described above were of the same basic type. The first model to deviate from the norm is the F27 Mk 500, which was proposed in 1961 but only ordered initially in 1966. This has a fuselage stretch of 1.5 m (4 ft 11 in), and was partnered by the Fairchild FH-227, which has a fuselage extension of 1.83 m (6 ft).

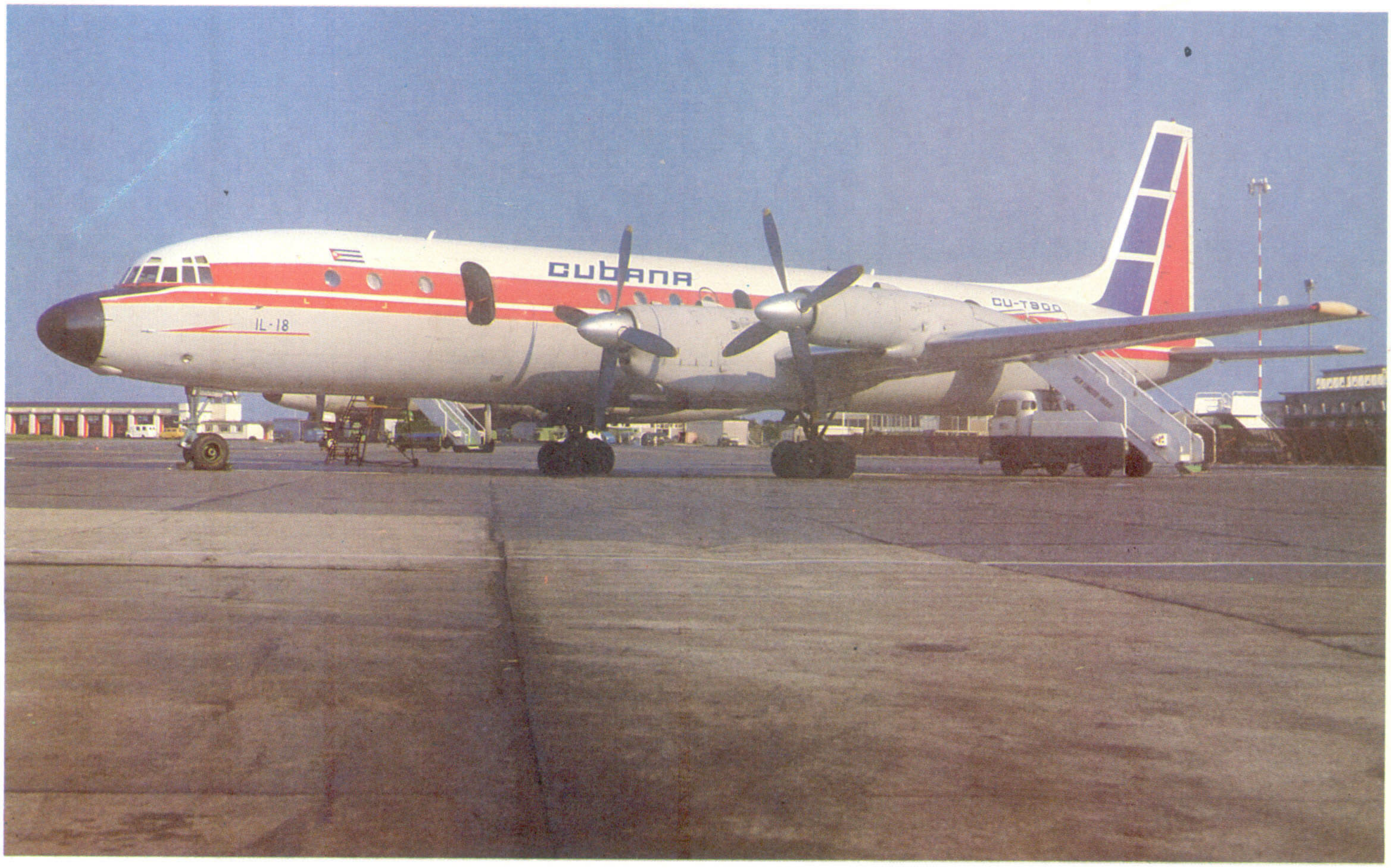
F27 Mk 500

Type: medium-range transport
Maker: Fokker-VFW BV
Span: 29 m (95 ft 2 in)
Length: 25.06 m (82 ft 2½ in)
Height: 8.71 m (28 ft 7¼ in)
Wing area: 70 m² (753 sq ft)
Weight: maximum 20 412 kg (45 000 lb); empty 11 950 kg (26 345 lb)
Powerplant: two 2140-hp Rolls-Royce Dart 532-7R turboprops
Performance: cruising speed 480 km/h (298 mph) at 6096 m (20 000 ft); range with 52 passengers and reserves 1740 km (1082 miles)
Payload: 5967 kg (13 155 lb); seats for up to 60 passengers
Crew: 2 to 3
Production: 500 (Fokker orders) and 207 (Fairchild-built) by 1980

Far left: An F27-400 operated by Gulf Aviation, which has been called Gulf Air since 1973
Left: A Fokker Friendship at Austin, Texas. The special long-nosed version, built by Fairchild, was designed to incorporate an all-weather radar

Il-18, Ilyushin

FIRST FLIGHT 1957

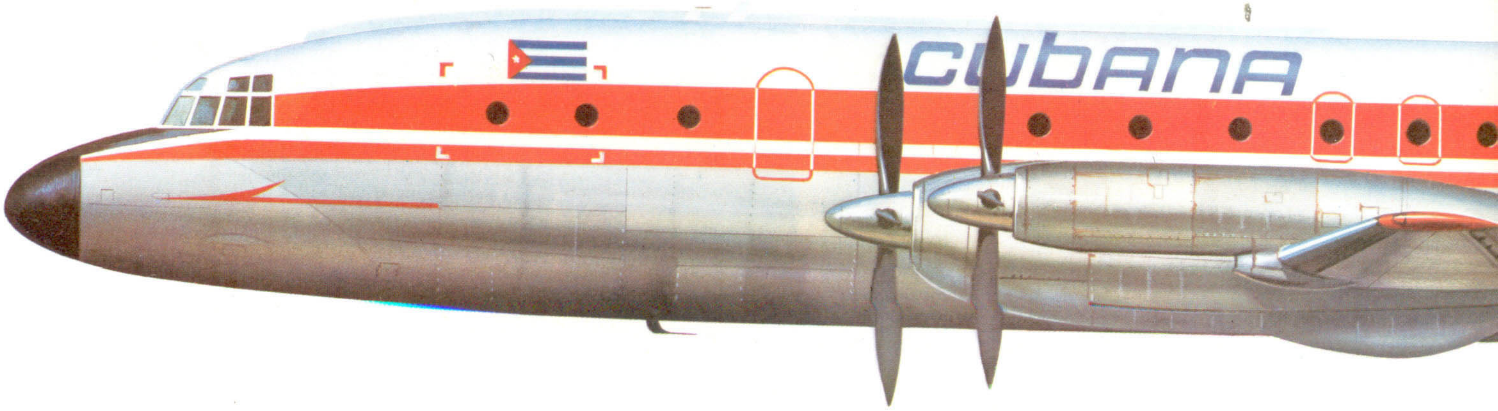


Above: An Il-18D operated by Cubana, the nationalized airline of Cuba, which was formed in 1929 and taken over by Castro in 1959
Below: The Il-18 has been used by CSA, Interflug, Malev. LOT and by non-Soviet bloc operators like Air Guinée, Air Mali and United Arab Airlines/Egyptair

THE Ilyushin Il-18 was the second turbine-powered Russian airliner, but the first to be specifically designed as such, the turbojet-engined Tupolev Tu-104 being a civil derivative of the Tu-16 bomber. The Il-18, at first called *Moskva*, was produced in response to an Aeroflot requirement for a turboprop-powered medium-range airliner.

The aircraft designed to meet this fairly exacting specification was a clean-looking four-engined machine similar in most respects to the contemporary British and US turboprop airliners, the Vickers Vanguard and Lockheed L-188 Electra. Powered by 4000-ehp Kuznetsov NK-4 turboprops, the first prototype took to the air on July 4, 1957 and soon proved itself to have admirable performance and handling. This aircraft was followed by four other prototypes, and then by 20 pre-production aircraft powered alternately by NK-4 and 4000-ehp Ivchenko AI-20 turboprops for comparative purposes. (The AI-20 and NK-4 were parallel developments of the same corpus of German research and development in World War II.) The AI-20 proved itself generally superior to the NK-4, and it was this engine which was selected for the initial production model, the Il-18V.

Trials of the Il-18 were completed by March 1958 after a highly satisfactory series of flights had been made, the most notable, perhaps, being that from Moscow via Irkutsk to Petropavlovsk in Kamchatka. The distance of 9000 km (5592 miles) was flown at an average speed of 600 km/h (373 mph) at an altitude of 8000 m (26 246 ft).



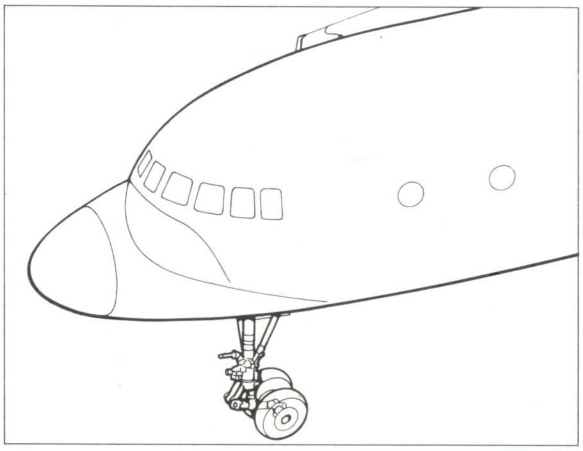
Production of the Il-18 began in 1957 at Factory No 30 outside Moscow, ending in 1968. Early operations were in the form of extended route-proving trials with loads of freight and mail in the Ukraine. Passenger-carrying services were inaugurated on April 20, 1959 on the route from Moscow to Adler and to Alma Ata, with the first international service being flown from Moscow to London in October 1959. These operations, flown with Il-18s and Il-18Bs (derived from the Il-18 but with take-off weight increased by 2000 kg [4409 lb] and with accommodation for 84 instead of 75 passengers), proved the general efficiency of the type, which was marred by some serious crashes resulting from problems with the AI-20 engines.

With these difficulties resolved, production was switched to the Il-18V in 1961. This model could seat up to 111 passengers, and is distinguishable by its repositioned windows and forward door, and by the smoother contours of the nose. More efficient AI-20Ks were at first fitted, but these have generally been replaced by AI-20Ms of higher rating.

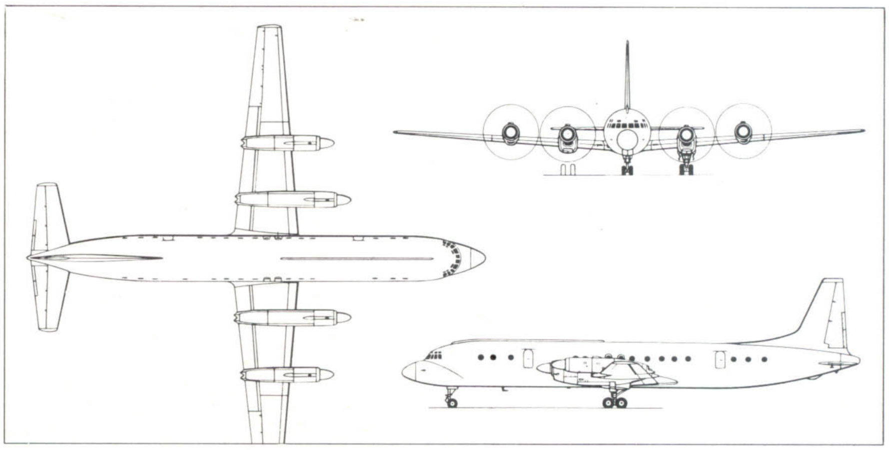
Next to appear was the single long-range Il-18I, with more fuel tankage in the wings to increase range from 4700 km (2921 miles) to 6500 km (4039 miles), and the ability to carry an additional 500 kg (1102 lb) of payload in the form of an increase in passenger capacity to 125 by extending the pressurized cabin back into the previous rear baggage compartment. The Il-18I did not enter service, but many of its improvements were incorporated in the long-range Il-18D, which entered service in 1966, powered by 4250-ehp AI-20Ms.

The final production variant was the Il-18E or Il-18Ye, with the fuselage of the Il-18D but the wings of the Il-18V with their 32% lower fuel capacity. The Il-18E was designed for rapid conversion into any of four seating layouts: six-abreast 122-seat summer, five-abreast 100-seat summer, six-abreast 110-seat winter and five-abreast 90-seat winter. This model entered service with Aeroflot during 1966 and it appears likely that earlier models have been brought up to Il-18E standard.

The most successful Russian airliner to date, the Il-18 was also supplied to non-Soviet bloc countries: Air Guinée (4), Air Mali (3), Ghana Airways (8, all returned), Royal Afghan Airlines (1), and United Arab Airlines/Egyptair (4). The latest development of the Il-18 has been into the Il-38 'May' maritime-reconnaissance aircraft.

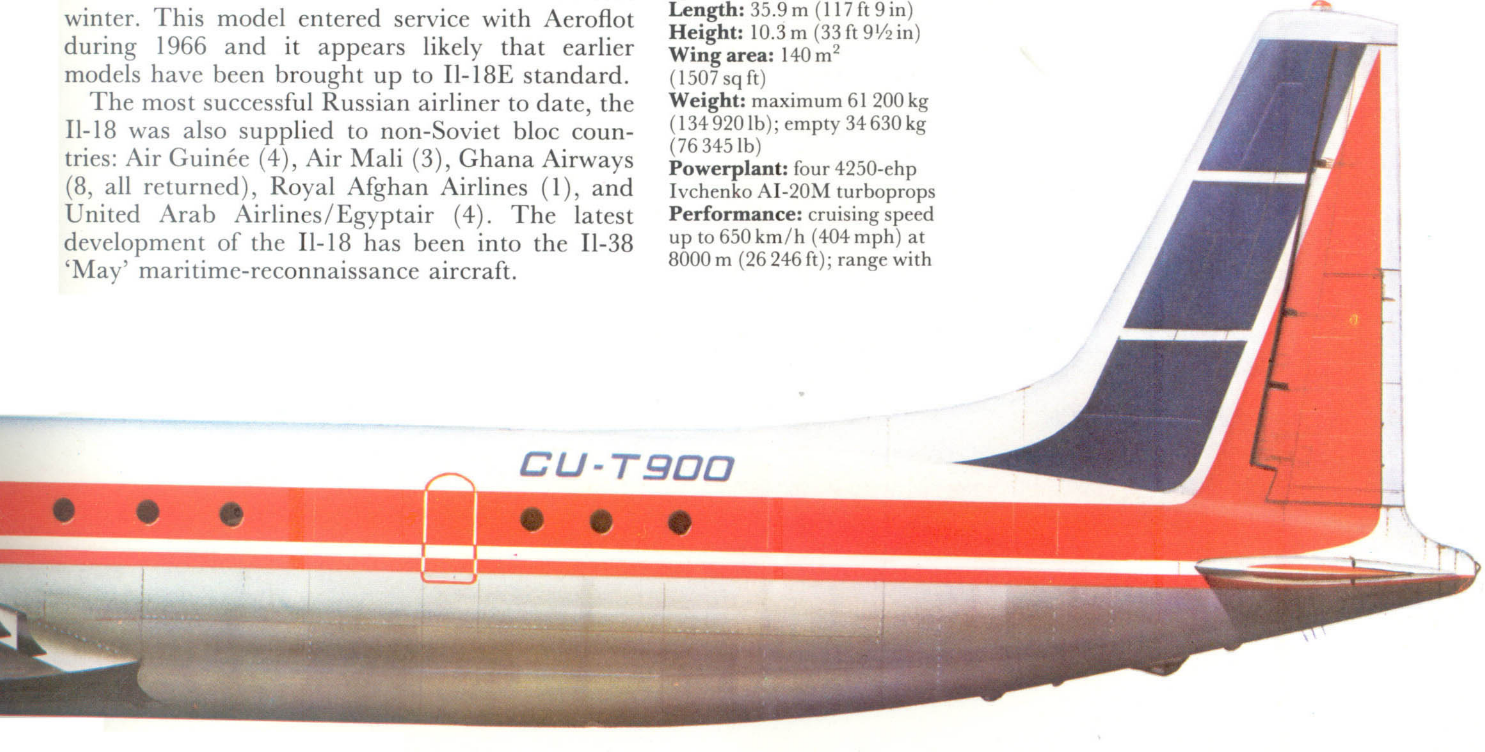


Left: The long-nosed front fuselage of the I1-18 was unusual in having a pressure bulkhead immediately ahead of the cockpit and a long way from the tip of the nose.



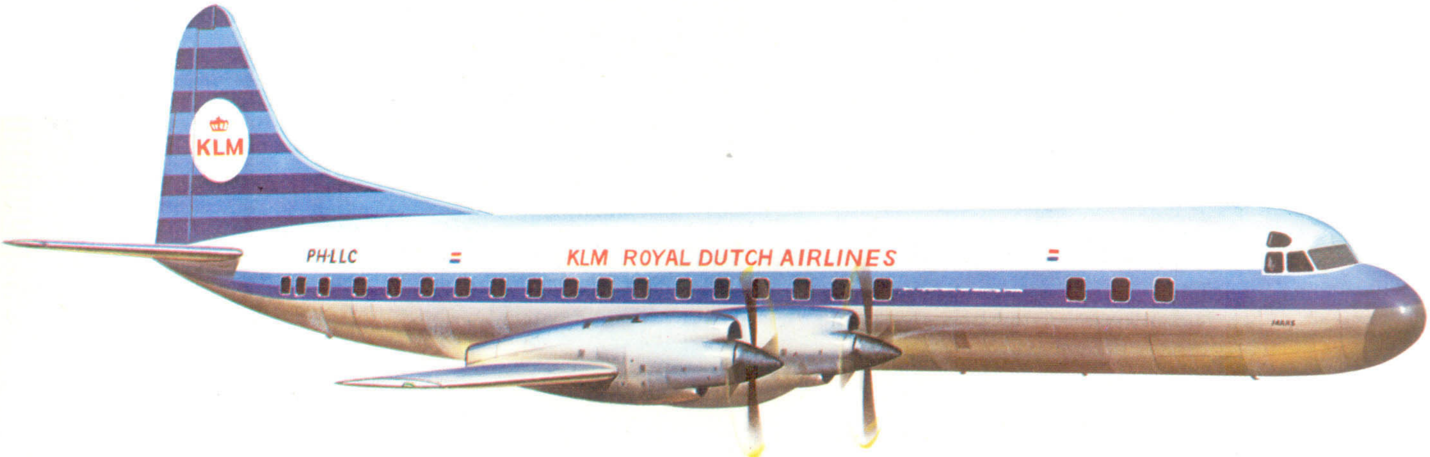
Il-18E

Type: medium-range transport
Maker: Ilyushin Design Bureau
Span: 37.4 m (122 ft 8 in)
Length: 35.9 m (117 ft 9 in)
Height: 10.3 m (33 ft 9½ in)
Wing area: 140 m^2 (1507 sq ft)
Weight: maximum 61 200 kg (134 920 lb); empty 34 630 kg (76 345 lb)
Powerplant: four 4250-ehp Ivchenko AI-20M turboprops
Performance: cruising speed up to 650 km/h (404 mph) at 8000 m (26 246 ft); range with maximum payload and reserves 2500 km (1553 miles)
Payload: 13 500 kg (29 762 lb); seats for up to 122 passengers
Crew: 4 to 5
Production: minimum 800



L-188 Electra, Lockheed

FIRST FLIGHT 1957



THE Lockheed L-188 Electra has the distinction of being the only large American airliner to have been developed with turboprop engines. Potentially an excellent aircraft, the Electra was unfortunately beset by severe structural problems and then surpassed in performance and operating economics by pure jet aircraft just as its fortunes were beginning to improve once again. To a great extent the L-188 was the result of the Capital Airlines' order for the Vickers Viscount. Though the 'big four' US operators did not follow suit, neither did they ignore the possibilities of turboprop power, and this foresight resulted in an American Airlines' requirement for a high-capacity short-haul airliner suitable for US inter-city routes.

Lockheed's L-188 was designed to meet this need, and the promise of the type was reflected in American Airlines' order of June 10, 1955 for 35 L-188s, and in Eastern Air Lines' order of September 27, 1955 for 40 similar aircraft.

The Lockheed concept was for an aircraft with considerably greater capacity (86 passengers) than the Viscount, but with comparable field performance thanks to the use of Allison 501 turboprops and an efficient wing design. The L-188 seemed ideal for its designed task, and Lockheed received a total of 144 orders by the time the first Electra flew on December 6, 1957, some 16½ months before the rival Vickers Vanguard. By the time of this first flight, the Electra had been fixed at a capacity of 100 passengers to be carried over a range of 3701 km (2300 miles) after take-off at a weight of

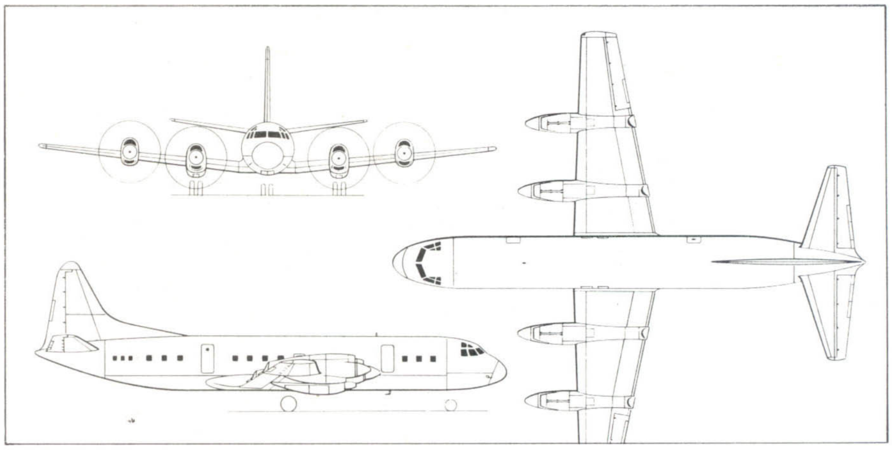
Above: The Electra operated with a number of major airlines in the early 1960s but accidents led to a fall off in orders
Below: A Jet Set Travel Club L-188C Electra at Long Beach International Airport, California

51 257 kg (113 000 lb). Three further development aircraft followed in 1958, and American Airlines received the first production Electra on December 5, 1958. The airline could not begin scheduled services with its new aircraft, however, as a result of a pilots' strike, leaving Eastern Air Lines this honour on January 12, 1959 with a service between New York and Miami.

Thereafter the Electra quickly established itself as an extremely popular inter-city airliner in North America. The success of the Electra seemed assured, with orders from several US airlines, the Dutch flag carrier KLM, and several operators in South-east Asia and Australia. But only a week after American Airlines finally began Electra services on January 23, 1959, one of its Electras crashed, as did a Braniff Electra on September 28, 1959 and a Northwest Airlines Electra on March 17, 1960.

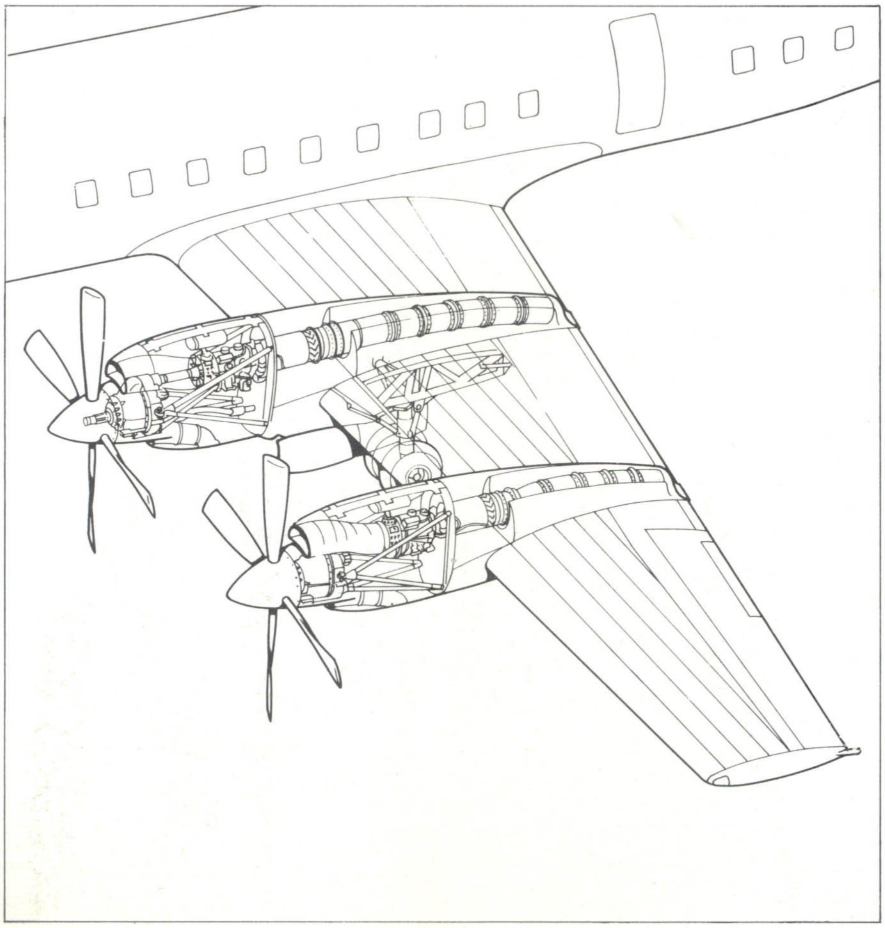
After evidence that the aircraft had broken up in the air, there was considerable pressure on the Federal Aviation Administration for the grounding of all Electras while the cause was investigated. The FAA merely imposed a 'speed limit' on the surviving 52 Electras: from March 25, 1960 they were restricted to 510 km/h (317 mph), reduced a few days later to 417 km/h (259 mph). During the following investigation, it was discovered that the Electra had a major design defect in the engine mountings. If such a mounting were only slightly damaged (in a heavy landing, for example), it was then possible for a structurally disastrous engine/propeller oscillation to ensue, resulting in wing failure. Lockheed immediately set about 'beefing up' Electras already built, type approval for the revised aircraft being secured on January 5, 1961. Modified aircraft, designated Electra IIs, returned to operations on February 24, 1961.

Lockheed had already developed the L-188C Electra for overwater operations, with additional fuel increasing range from the 4023 km (2500 miles) of the L-188A to 4860 km (3020 miles) with maximum fuel. The last 55 Electras built were to this standard, but it is interesting to note that the earlier crashes had so curtailed Electra orders that only 26 more were later sold. The manifest virtues of the Electra have been recognized by the type's development into the most widely sold maritime-reconnaissance aircraft, the Lockheed P-3 Orion.



L-188C Electra

Type: medium-range transport
Maker: Lockheed Aircraft Corporation
Span: 30.18 m (99 ft)
Length: 31.9 m (104 ft 8 in)
Height: 10.04 m (32 ft 11¼ in)
Wing area: 120.8 m² (1300 sq ft)
Weight: maximum 52 617 kg (116 000 lb); empty 25 855 kg (57 000 lb)
Powerplant: four 3750-ehp Allison 501-D13 turboprops
Performance: maximum cruising speed 652 km/h (405 mph) at 6706 m (22 000 ft); range with a payload of 9979 kg (22 000 lb) 4023 km (2500 miles)
Payload: 11 975 kg (26 400 lb); seats for up to 99 passengers
Crew: 3 to 4
Production: 170



Left: The Electra was notable for its Allison 501-D13 turboprop with its separately mounted reduction gearbox. In 1959 serious defects in the engine mountings were discovered, and the engine nacelle and surrounding wing structure had to be strengthened

BAe 748, British Aerospace

FRIST FLIGHT 1960

THE origins of the BAe 748 can be traced back to the now infamous government white paper foretelling the demise of the manned military aircraft, on which Avro had devoted its exclusive efforts for more than ten years. The company therefore turned its attentions to a feederliner replacement for the Douglas DC-3.

From the Avro point of view, the difficulty was that Fokker was already well along the way to production with the F27 Friendship, and had secured considerable orders. The Avro competitor, the company felt, should therefore be able to attract customers with superior performance allied to cheaper purchasing and operating costs. After initial studies for a machine resembling a scaled-down F27, Avro finally opted for a 748 design centred on two Rolls-Royce Dart turboprops and a low-wing configuration. Detail design of the Hawker Siddeley 748, as it had by then become, was started in January 1959: maximum weight was to be 14 969 kg (33 000 lb) and accommodation for 36 passengers four-abreast was to be provided.

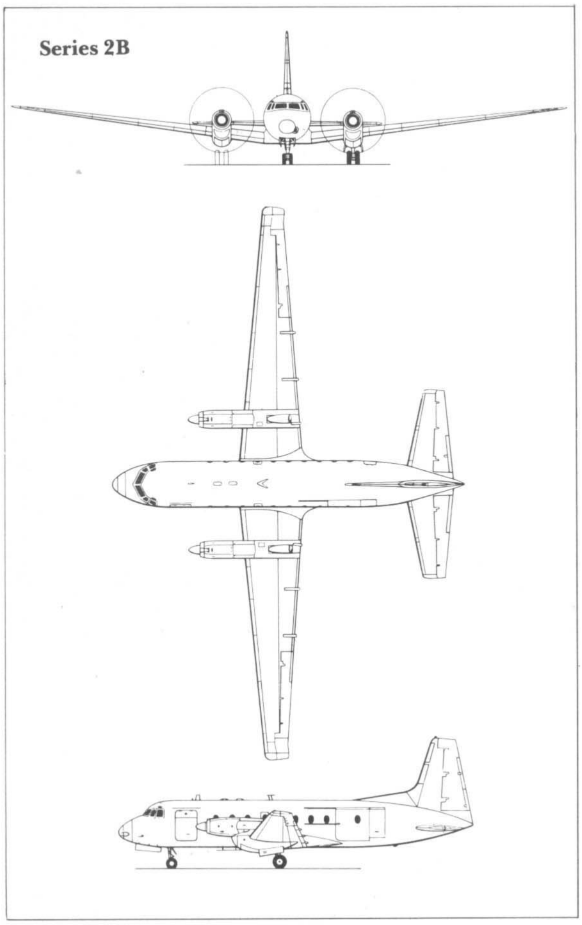
Two prototypes for flight trials were begun in parallel with two static test airframes, the first aircraft flying on June 24, 1960 and the second on April 10, 1961. Flight trials soon proved that structural weight-saving by the use of fail-safe rather than safe-life structures had benefited the type, and that the provision of slotted Fowler flaps gave the 748 good short-field performance.

The two prototypes, powered by Rolls-Royce Dart RDa. 610 Mk 514 engines, were followed by 18 generally similar Series 1 aircraft, the main buyer being Aerolineas Argentinas with 12, but the first purchaser was Skyways Coach-Air (now Dan-Air) with three for cross-Channel flights early in 1962.

The next model was the 748 Series 2, which entered production in 1961. This model features more powerful Dart RDa. 7 Mk 531 engines and a maximum take-off weight of 20 183 kg (44 495 lb), some 2266 kg (4995 lb) greater than the maximum take-off weight of the Series 1 aircraft. A Series 1 aircraft converted to Series 2 standard first flew on November 6, 1961 and deliveries began in October 1962. A total of 198 were built before production was switched to the Series 2A.

This model was introduced to improve the performance of the Series 2 by the provision of more powerful engines, the Dart RDa. 7 Mk 532-2L or -2S (later redesignated Mk 534-2 and 535-2 respectively), each rated at 2280 ehp. Orders for the type total 71, with another 25 of a sub-model unofficially designated Series 2C. This model, intended primarily for military users, is fitted with a large freight door, measuring 1.72 m (5 ft 7¾ in) in height and 2.67 m (8 ft 9 in) in width, in the left side of the rear fuselage. A strengthened floor is fitted, and an air-portable freight hoist is optional. This model first flew on December 31, 1971, in the form of a converted Series 2A aircraft.

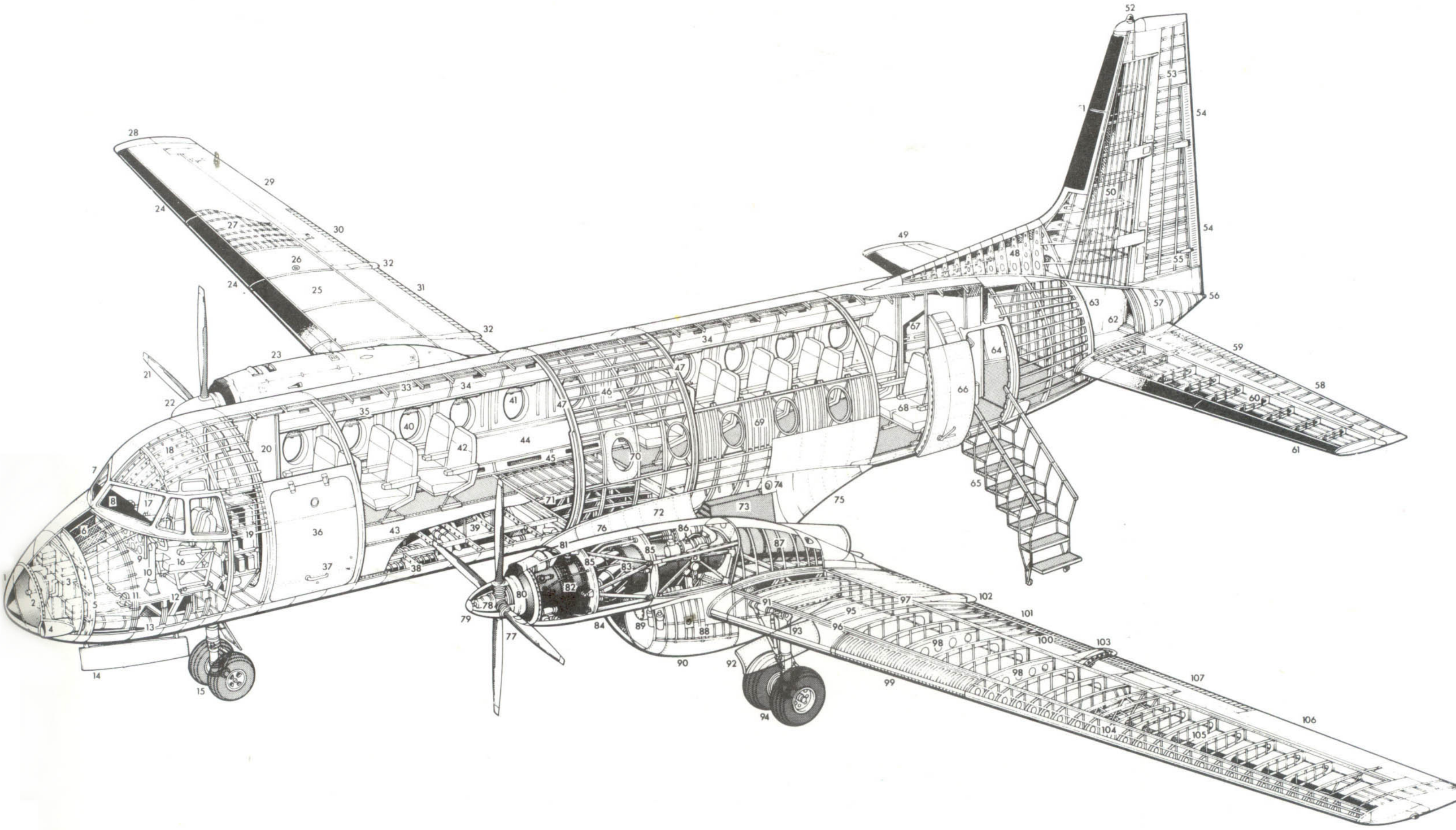
Hawker Siddeley was eventually absorbed into British Aerospace, and it was this concern which introduced from early 1979 the Series 2B aircraft. This is intended for operations in 'hot and high' conditions, admirably suited for the increasing numbers of airlines in West Africa and the Caribbean. Power is provided by a pair of 2280-ehp Dart



748 Series 2A

Type: short-range transport
Maker: British Aerospace Aircraft Group
Span: 30.02 m (98 ft 6 in)
Length: 20.42 m (67 ft)
Height: 7.57 m (24 ft 10 in)
Wing area: 75.3 m^2 (811 sq ft)
Weight: maximum 21 092 kg (46 500 lb); empty 12 159 kg (26 806 lb)
Powerplant: two 2280-ehp Rolls-Royce Dart 534-2 or 535-2 turboprops
Performance: cruising speed 452 km/h (281 mph); range with maximum payload and reserves 1360 km (846 miles)
Payload: 5304 kg (11 694 lb); seats for up to 58 passengers
Crew: 3
Production: 352 ordered by 1980

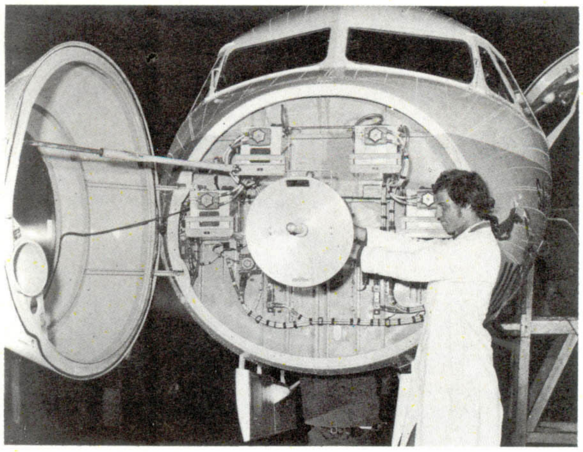
Left: Checking the right-hand engine of a BAe 748. The twin Rolls-Royce Dart RDa.7 Mk 536-2s each drive a Dowty Rotol four-blade constant-speed fully-feathering propeller



BAe 748

1 Radome
2 Radar scanner
3 Electrical equipment
4 Air intake
5 Front bulkhead
6 Nose structure
7 Windscreens
8 Instrument panel shroud
9 Instrument panel
10 Control column
11 Rudder pedals
12 Nosewheel bay structure
13 Air ducting
14 Nosewheel door
15 Twin nosewheels
16 Pilot's seat
17 Co-pilot's seat
18 Cabin roof structure
19 Radio rack
20 Forward baggage hold
21 Dowty Rotol four-blade propeller
22 Spinner
23 Right engine cowlings
24 Leading edge de-icing sections
25 Right wing fuel tank
26 Fuel filler
27 Wing stringers
28 Right wingtip
29 Right aileron
30 Aileron tab
31 Right flap
32 Flap fairings
33 Fuselage frames
34 Overhead baggage lockers
35 Passenger service units
36 Freight and crew door
37 Door handle
38 Air conditioning heat exchangers
39 Cabin floor structure
40 Cabin windows
41 Window blind
42 Passenger seats
43 Floor fixing rails
44 Cabin trim panels
45 Air louvres
46 Centre fuselage construction
47 Wing beam carrying frames
48 Fin root fairing
49 Right tailplane
50 Fin construction
51 Fin leading edge de-icing
52 Anti-collision light
53 Rudder construction
54 Rudder tabs
55 Tab control rod
56 Navigation light
57 Tailcone
58 Left elevator
59 Elevator tab
60 Left tailplane construction
61 Tailplane leading edge de-icing
62 Fin-tailplane joint
63 Aft fuselage bulkhead
64 Aft baggage hold
65 Folding airstairs
66 Passenger door
67 Toilet compartment
68 Rear cabin seating
69 Window frame panel construction
70 Escape hatch
71 Centre wing construction
72 Wing root fillet
73 Water methanol boost tank
74 Filler cap
75 Trailing edge fairing
76 Left engine top cowling
77 Dowty Rotol four-blade propeller
78 Propeller pitch change mechanism
79 Spinner
80 Engine air intake
81 Oil cooler duct
82 Rolls-Royce Dart 535-2 turboprop
83 Engine mounting frame
84 Engine bottom cowlings
85 Fireproof bulkheads
86 Engine accessory equipment
87 Jet pipe
88 Undercarriage bay
89 Hydraulic equipment
90 Mainwheel doors
91 Mainwheel leg pivot
92 Leg fairing doors
93 Shock absorber strut
94 Twin mainwheels
95 Left wing fuel tank
96 Front spar
97 Rear spar
98 Fuel tank bulkheads
99 Leading edge de-icing
100 Flap profile structure
101 Trailing edge flap
102 Flap fairing
103 Flap tracking
104 Leading edge construction
105 Outer wing construction
106 Left aileron
107 Aileron tab

Far left: The spacious cockpit of a 748
Left: Normal accommodation in the 748 civil transport is for 40 to 58. The main passenger door is on the left at the rear



Above: HK-1409, a BAe 748 of the Colombian airline Avianca
Far left: A brightly coloured twin-engined Bahamasair BAe 748. Founded in 1973, this airline is the only one providing scheduled services throughout the Bahamas
Left: making adjustments to the Bendix solid-state radar
Below left: Loading baggage; this door can also serve as an emergency exit

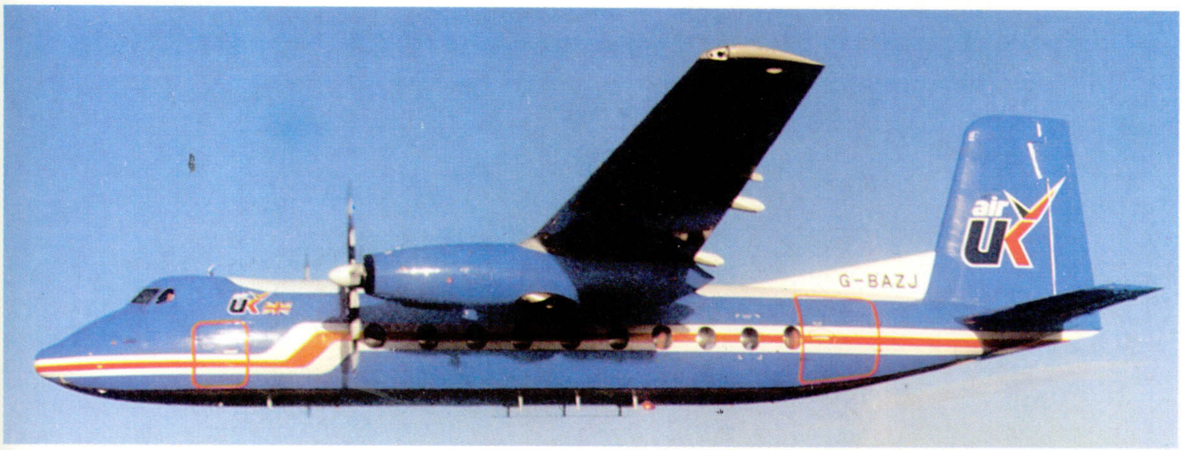
RDa 7 Mk 536-2 turboprops, and the wings have been increased in span by 1.22 m (4 ft) but reduced in drag, with the tail modified.

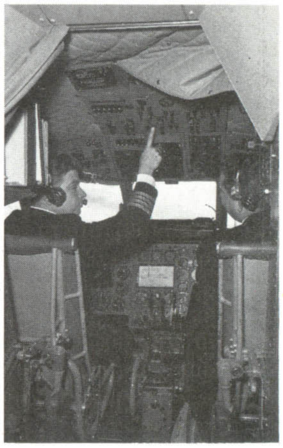
Apart from these models, the aircraft has also appeared as the Andover for the Royal Air Force (31 Andover C.1/Series 2A and six Andover CC.2/Series 1), and is also being built under licence in India by Hindustan Aeronautics Limited. HAL is producing a total of 79 aircraft, 62 of them for the Indian air force and the rest for Indian Airlines.

The Series 2B is currently offered by British Aerospace in the form of the 748 Civil Transport, the 748 Military Transport, and the 748 Coastguarder maritime-reconnaissance aircraft with search radar under the forward fuselage.

Herald, Handley Page

FIRST FLIGHT 1955





THE development of the HPR.3 Herald began in 1954, and the first of two prototypes flew on August 25, 1955, orders by this time totalling 29 from one Colombian and two Australian operators. The second prototype flew a year later, but although an initial batch of 25 aircraft was proposed, it soon became clear that in its current form the Herald fell far short of the performance that operators would like, and which turboprop-powered aircraft such as the Vickers Viscount could offer.

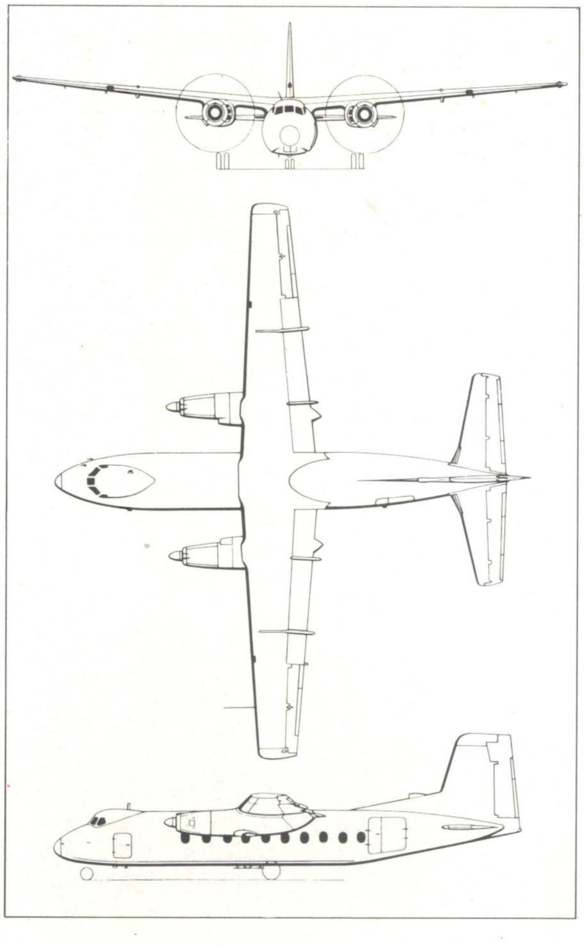
Handley Page had already begun to consider a turboprop-powered variant, the HPR.4 with a pair of Napier Eland engines. Then in July 1955 the company made a serious study of the basic Herald powered by two Rolls-Royce Dart turboprops, and in July 1957 Handley Page made the sensible decision to abandon further development of the HPR.3 in favour of the HPR.7 Herald. The two HPR.3 prototypes were re-engined, flying on March 11, and December 17, 1958 respectively, with the initial name Dart-Herald, later changed to Herald.

The first production type was the Series 100, the initial example of which (a company-owned aircraft) flew on October 30, 1959. The only other Series 100 Heralds were three aircraft for British European Airways, for use on the airline's routes in the highlands and islands of Scotland. Apart from the use of two Dart 527s in place of four radial engines, the Series 100's main distinguishing feature compared with the HPR.3 was a 50.8-cm (20-in) lengthening of the forward fuselage to bring the door clear of the propellers.

The next model was the Series 200, produced to meet a requirement of Jersey Airlines. This had a number of detail improvements, but was most notable for a fuselage stretch of 1.09 m (3 ft 7 in) to make possible the accommodation of up to 56 passengers instead of 47. The second prototype HPR.3/HPR.7 was converted to the new standard, first flying on April 8, 1961 with an increase in maximum take-off weight of 907 kg (2000 lb). The first production Series 200 aircraft flew on December 13, 1961, deliveries to the airline beginning in January 1962. Production of the Series 200 totalled only 36 before the financial collapse of Handley Page in August 1969.

The only other Heralds were eight Series 400 aircraft for the Malaysian air force. Today, the largest operator is Air UK, with 20.

Above left: A Handley Page Herald of Air UK
Above right: Captain J North and Flight Officer I Reed at the controls of a BEA Herald
Above: Fitting long-range fuel tanks for a South American tour



HPR.7 Herald

Type: short-range transport
Maker: Handley Page Ltd
Span: 28.89 m (94 ft 9½ in)
Length: 23.01 m (75 ft 6 in)
Height: 7.11 m (23 ft 4 in)
Wing area: 82.3 m² (886 sq ft)
Weight: maximum 19 505 kg (43 000 lb); empty 11 322 kg (24 960 lb)
Powerplant: two 2105-ehp Rolls-Royce Dart 527 turboprops
Performance: cruising speed 435 km/h (270 mph) at 4572 m (15 000 ft); range with maximum payload and reserves 1127 km (700 miles)
Payload: 5307 kg (11 700 lb); seats for up to 56 passengers
Crew: 2
Production: 48

Vanguard, Vickers-Armstrongs

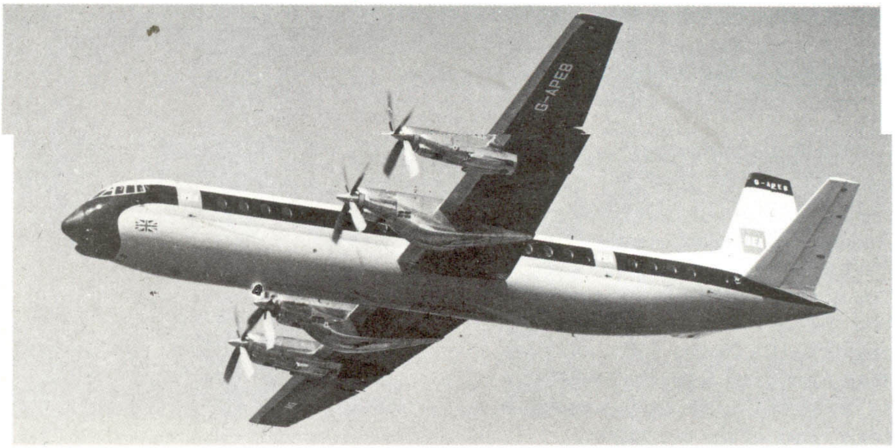
FIRST FLIGHT 1959

THE Vickers Vanguard, designed basically as a replacement for the highly successful Vickers Viscount, was in essence an excellent design. Resulting from a British European Airways requirement for an airliner somewhat larger than the Viscount, with superior operating economics and performance, to enter service in 1959, the Vanguard fitted the BEA requirement well.

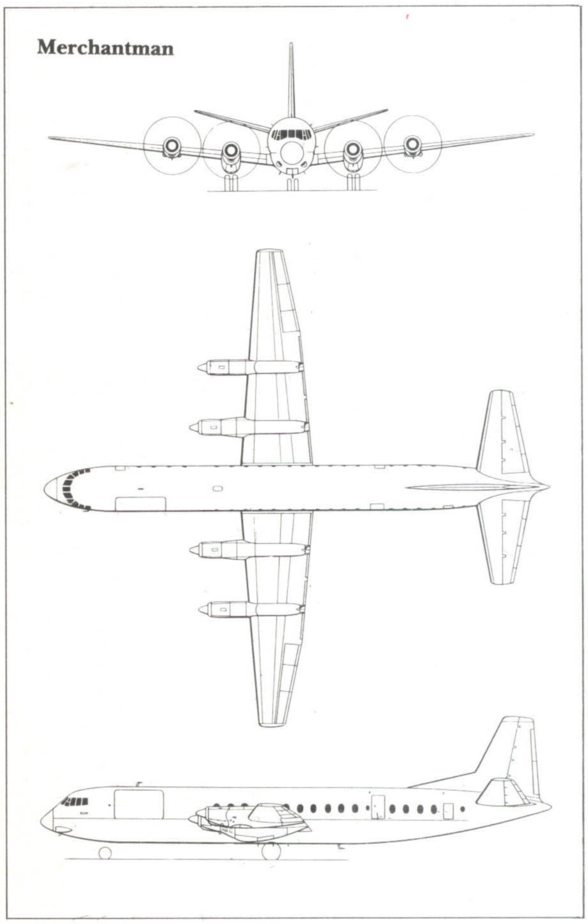
Entirely by coincidence, it was on April 15, 1953 that BEA and Trans-Canada Air Lines issued requirements for similar aircraft, that of Trans-Canada specifying a load of 60 passengers to be carried over transcontinental ranges at a maximum take-off weight of 32 659 kg (72 000 lb). BEA at first held out for a high-set wing, to afford passengers the best possible view, but eventually came into line with Trans-Canada when the advantages of loading freight into the large lower-lobe of the 'double-bubble' fuselage were taken into account.

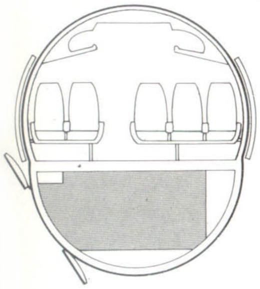
Some 60 preliminary designs were considered, including several with swept wings, but the combination of a cruising speed of 644 km/h (400 mph) and the specified low landing speed finally decided the Vickers design team on a straight wing set at the low mid-wing position, and a powerplant comprising four Rolls-Royce RB.109 turboprops. The engine later became the Tyne RTy. 1. After a prolonged interim period as the Type 870, the Vickers aircraft was finally designated the Type 900. Up to 100 passengers or a payload of 9526 kg (21 000 lb) were to be carried, and gross weight was to be 61 236 kg (135 000 lb) in the ultimate design, the Type 950 named Vanguard by BEA. During 1955 and 1956 BEA negotiated for the purchase of 20 Vanguards, the contract being signed on July 20, 1956 and calling for the type to be in service during 1960.

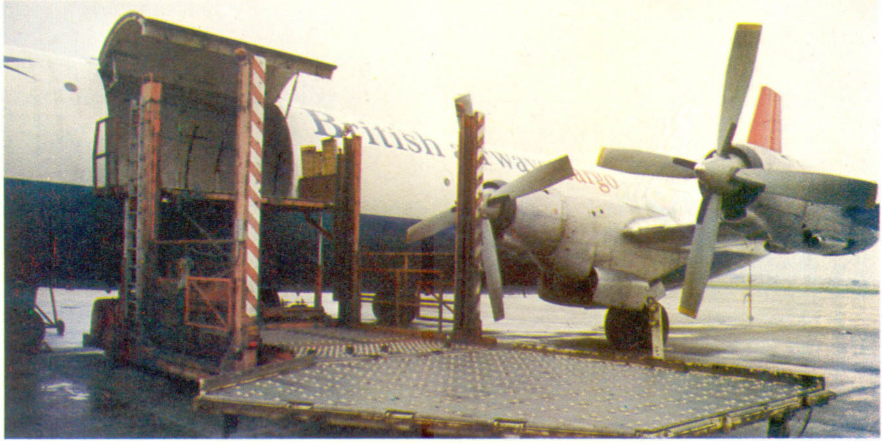
Trans-Canada had meanwhile been biding their time, as the basic Vanguard (BEA's Type 951) did not meet their stringent requirements. Vickers therefore evolved the Type 952 for Trans-Canada, with maximum seating for 139 passengers six-abreast, a maximum payload of 10 886 kg (24 000 lb) and a gross weight of 63 958 kg (141 000 lb). The different ranges specified by BEA and Trans-Canada (1609 km [1000 miles] and transcontinental) had been catered for in the original design by the incorporation of high fuel tankage. In January 1957 Trans-Canada ordered



Top: An Air Canada Vanguard CF-TKK in August 1970. It was subsequently transferred to Europe Aéro Service, Perpignan, in 1972 as F-BTYB
Above: G-APEB which first flew in 1959 and was delivered to BEA in 1961
Above right: The seating and baggage accommodation
Above far right: Preparing to unload a Vanguard Merchantman







20 Type 952s, and later ordered another three.

With construction of the prototype Type 950 underway, BEA in 1958 realized that where maximum-fuel range was not required, the weight thus saved could be traded for extra payload at the same gross weight of 63 958 kg (141 000 lb). The result was the Type 953, announced by Vickers in July 1958, with a payload of 13 154 kg (29 000 lb). The BEA order was thus altered to six Type 951 and 14 Type 953 Vanguards.

The first Vanguard flew on January 20, 1959 and performance in general was all that could be asked for in an aircraft with turboprop engines and conservative structural design. Although Vickers tried hard to secure further orders, none were forthcoming as at that time the airlines had a fixation on buying the latest pure jet airliners.

The first Vanguard Type 951, with 4985-ehp Tyne 506s, was delivered to BEA on December 2, 1960, and the type entered scheduled service on March 1, 1961. The first Vanguard Type 952 for Trans-Canada, with 5545-ehp Tyne 512 engines, had meanwhile flown its first service on February 1, 1961. The first Vanguard Type 953 entered service late in May 1961.

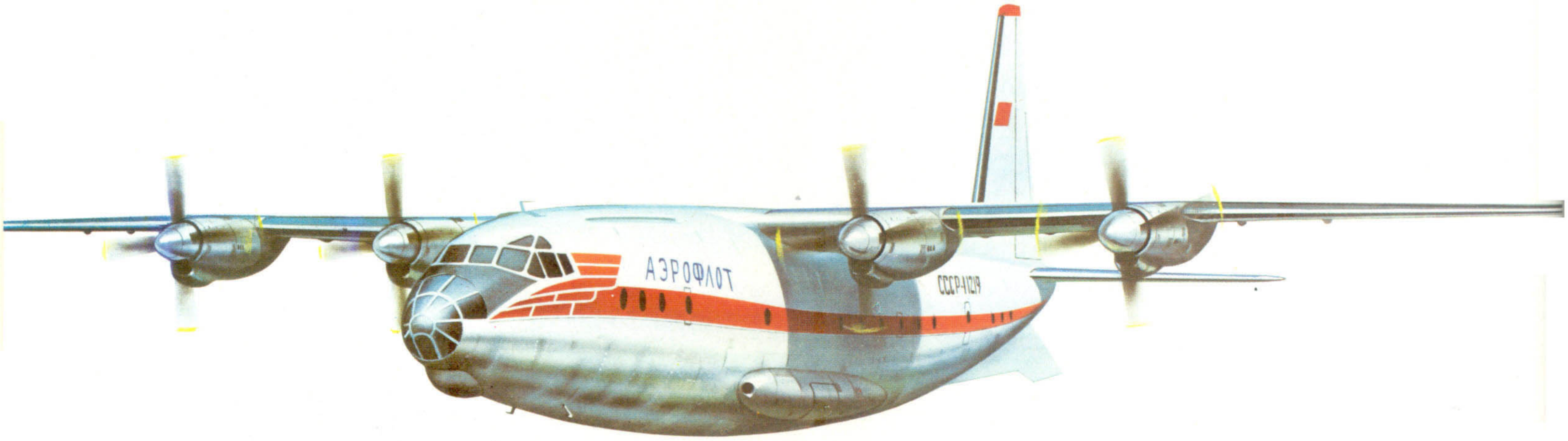
By October 1968 the limited success of the Vanguard for passenger operations persuaded BEA to start converting its aircraft to an all-freight configuration, with the name Merchantman. The conversion was carried out by Aviation Traders, and nine Vanguards were converted with large freight doors in the left side of the forward fuselage.

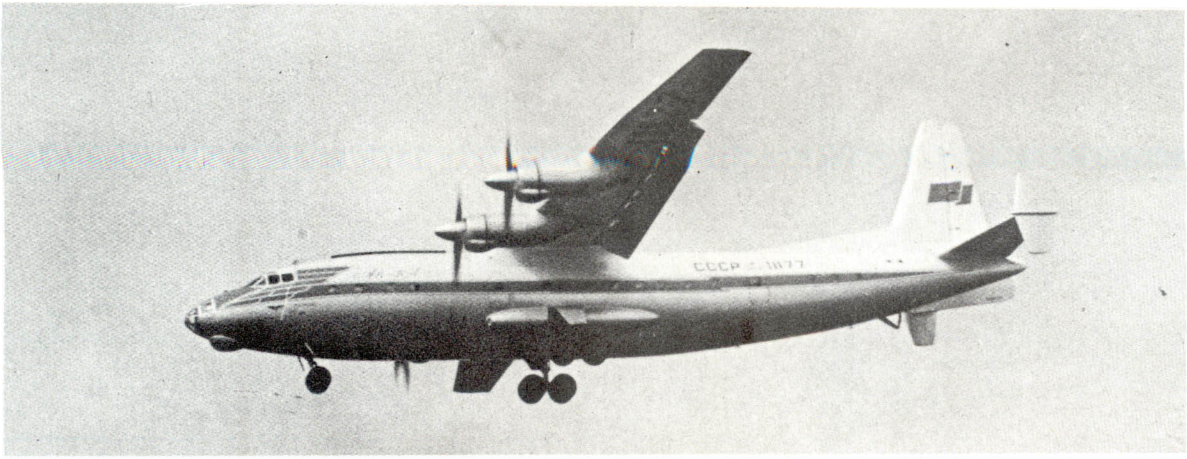
Vanguard Type 952

Type: medium-range transport
Maker: Vickers-Armstrongs Aircraft Ltd
Span: 35.97 m (118 ft)
Length: 37.45 m (122 ft 10½ in)
Height: 10.64 m (34 ft 11 in)
Wing area: 141.9 m² (1527 sq ft)
Weight: maximum 63 958 kg (141 000 lb); empty 38 556 kg (85 000 lb)
Powerplant: four 5545-ehp Rolls-Royce Tyne RTy. 11 Mk 512 turboprops
Performance: maximum cruising speed 684 km/h (425 mph) at 6096 m (20 000 ft); range with maximum payload 2945 km (1830 miles)
Payload: 16 783 kg (37 000 lb); seats for up to 139 passengers
Crew: 3
Production: 44

An-10, Antonov

FIRST FLIGHT 1957



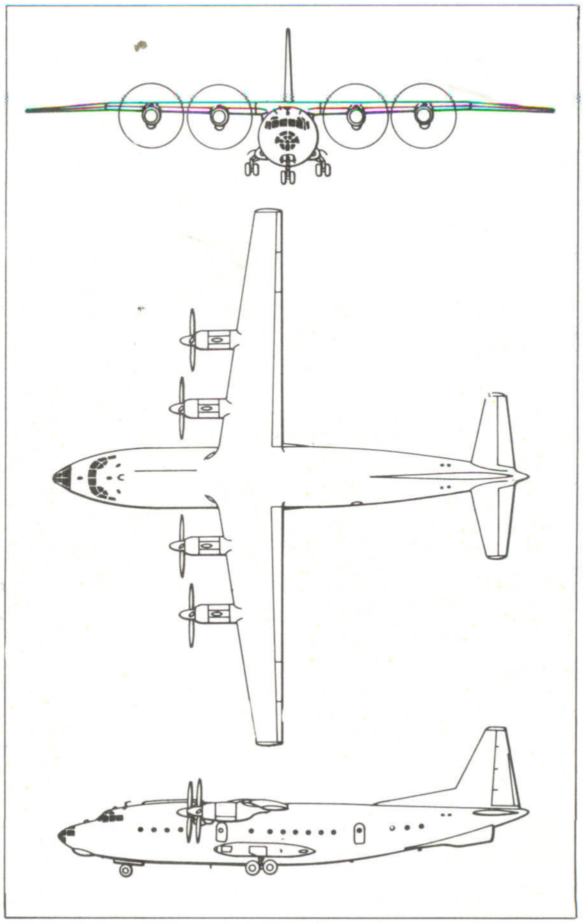


Above; An Aeroflot An-10; in 1966 An-10s and 10As were operating on more than 90 routes and carried 4 200 000 passengers
Left: An An-10 comes in to land. The retractable landing gear was designed for soft-field operations and the endplate fins were intended to rectify instability

THE Antonov An-10 was derived from the An-8, which had itself been produced to meet a joint military and civil requirement, in the light of Aeroflot's revised needs in 1955, shortly after the An-8 had first flown. The new Aeroflot requirement called for four instead of two engines, increased passenger capacity, and full pressurization. The design of the An-10, as the new aircraft was designated, began in November 1955: the plan of the wings, tail unit and undercarriage (the last specifically designed for rough-field operations, with its main units retracting into fuselage blisters) remained substantially unaltered, while the new fuselage was circular in section not slab-sided.

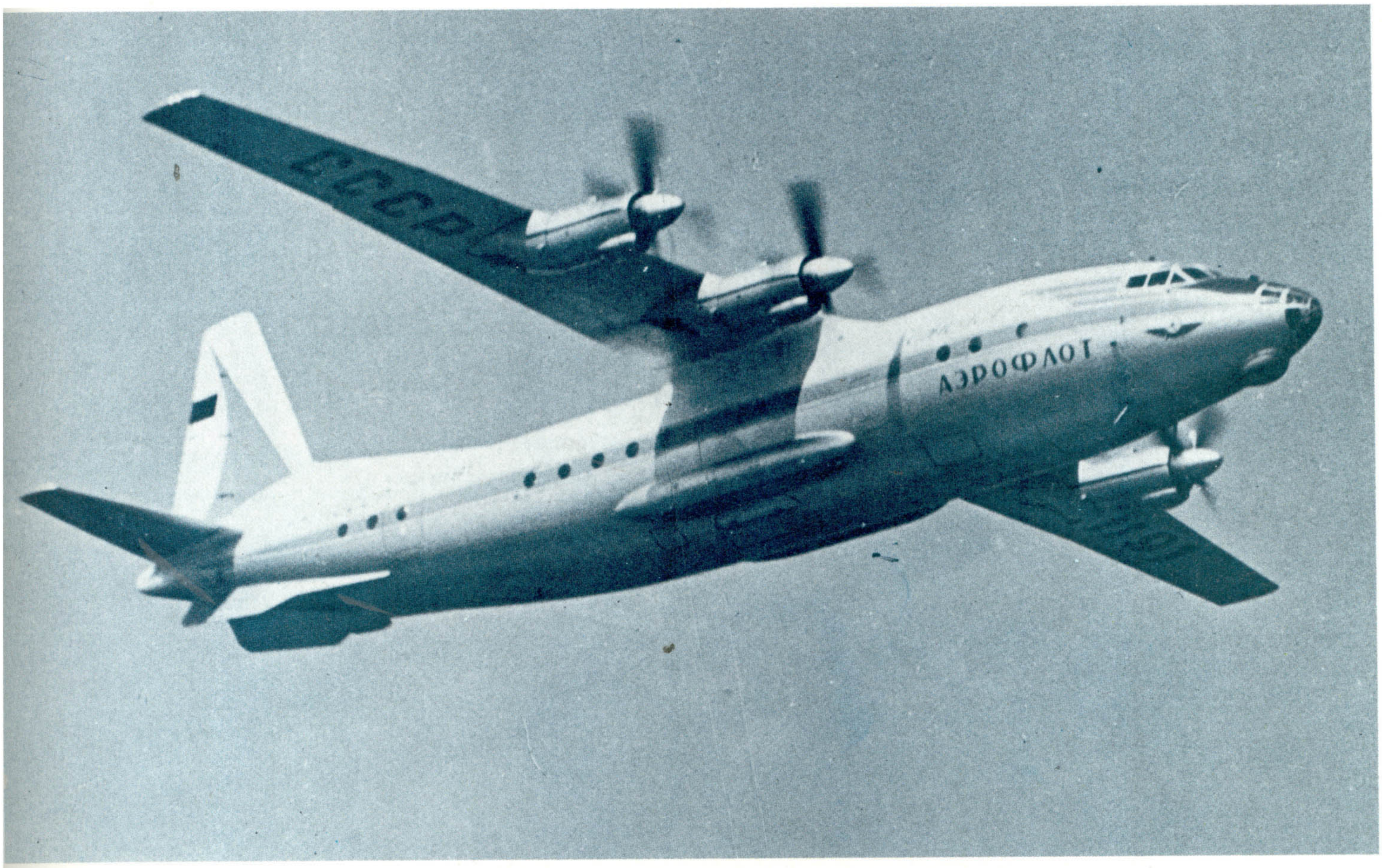
The first prototype flew on March 7, 1957 and because of the similarity of the design to that of the An-8, it was expected that production An-10s would rapidly be in service. The engines used in the first two prototypes were 4000-ehp Kuznetsov NK-4 turboprops, but all other An-10s were fitted with 4000-ehp Ivchenko AI-20s, which offered a usefully lower specific fuel consumption. All was not well with the design, however, and instead of the projected nine months, it took some 30 months to get the An-10 into Aeroflot service.

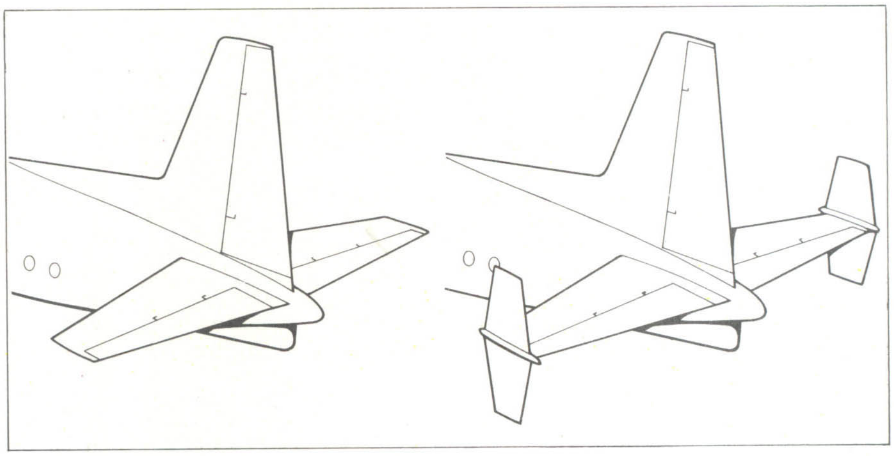
The exact nature of the problem is not certain, but probably included lateral and directional instability. The interval between the first flight and the service introduction of the type was marked by a number of modifications, including the provision of anhedral on the outer wing panels and a number of auxiliary vertical tail surfaces. Apart from an extension forward of the dorsal fillet, these com-



An-10A

Type: medium-range transport
Maker: Antonov Design Bureau
Span: 38 m (124 ft 8 in)
Length: 34 m (111 ft 6 in)
Height: 9.38 m (30 ft 9 in)
Wing area: 121.73 m^2 (1310 sq ft)
Weight: maximum 54 000 kg (119 048 lb); empty not available
Powerplant: four 4000-ehp Ivchenko AI-20 turboprops
Performance: cruising speed up to 680 km/h (423 mph) at 8000 m (26 247 ft); range with maximum payload and reserves 1220 km (758 miles)
Payload: 14 500 kg (31 966 lb); seats for up to 110 passengers
Crew: 5
Production: approx 200





prised a fairly large ventral fin, later supplemented by relatively small endplate fins.

With its stability problems apparently solved, the An-10 began freight operations in the Ukraine during May 1959, and the type flew its first scheduled passenger service on July 22, 1959, with a flight from Moscow to Simferopol in the Crimea. Passenger accommodation of the An-10 was 90. Though the first prototype had featured a small playroom for children, at the rear of the main cabin, this was replaced on production aircraft by a cabin for six passengers.

In 1958 the Russians announced the An-10A stretched version of the An-10, which had been named Ukraine. This improved model was lengthened by 2 m (6 ft 6¾ in), and could seat up to 100 passengers five- and six-abreast for normal operations, or up to 110 passengers for high-density routes. The An-10A also had reversible-pitch propellers to reduce landing run, and late-production An-10As also had twin ventral fins replacing the previous arrangement of one ventral and two endplate fins.

The performance of the An-10A was recognized by the establishment of two records: in May 1960 an An-10A covered 2000 km (1243 miles) with a payload of 15 000 kg (33 069 lb) at an average speed of 723 km/h (449 mph); and on April 29, 1961 another An-10A covered a 500-km (311-mile) closed circuit at 731 km/h (454 mph).

At the same time that the An-10A was announced, it was also reported that there was to be an An-10B (otherwise reported as the An-16), with a fuselage stretch of 3 m (9 ft 10 in) to increase the freight volume and also passenger capacity to 130. This model was apparently not built. One An-10 derivative was built, however, in the form of the An-12 logistic transport. This featured a totally revised, upswept rear fuselage, and though designed principally with the needs of the Soviet air force in mind, has been used by a number of civil operators, often with rear turret fitted.

All An-10s and An-10As were withdrawn from service after one of the type crashed near Kharkov on May 18, 1972, killing all 108 passengers and crew.

By mid 1967 the two versions, about 300 in total by this time, had among them managed to transport the respectable total of 12 million passengers.

Top: An Aeroflot An-10A at Moscow Domodedovo Airport on July 9, 1967, to mark the 50th anniversary of the Soviet October Revolution. Note the large twin ventral fins which replaced the auxiliary rear fins
Above: The prototype An-10 had early directional stability problems which were remedied on the An-10A by adding, initially, an under-fin, and later still endplate fins on the tailplane

An-24, Antonov

FIRST FLIGHT 1959

Top: An Antonov 24 of Misrair, a charter subsidiary of Egyptair which connects Cairo with Luxor, Aswan and Abu Simbel
Above: SP-LTI, and An-24 of LOT, Polskie Linie Lotnicze, the Polish airline which operates 18 passenger-carrying An-24s and one cargo-carrier

THE Antonov An-24 marks yet another effort by the world's aircraft manufacturers and users to find a twin-turboprop replacement for the Douglas DC-3, in this instance the licence-built Russian version, the Lisunov Li-2. The origins of the An-24 lie in a 1957 Aeroflot requirement for a 40-seat turboprop airliner able to replace the Ilyushin Il-14 and Li-2 over stages of up to 1000 km (621 miles), and able to operate from airfields that possessed only short, unpaved runways. It was this last factor, together with the desirability of easy loading, which led the Antonov design team to choose a high-wing for their An-24.

Design began in 1958, and the first prototype flew on December 20, 1959, having been built in only 14 months despite a change in the Aeroflot requirement which entailed a fuselage stretch to allow the aircraft to carry up to 50 passengers in a high-density internal layout, or up to 44 in normal circumstances. All necessary trials were completed by September 1962.

Only a few An-24s, with seating for 40 passengers, were built. These were distinguishable from the prototypes by their longer engine nacelles, and by the standardization of the ventral fin tested on the second prototype. The first scheduled service by the type was flown with an An-24 in October 1962 between Kiev and Kherson. This 40-seater was soon supplanted in production by a 44-seat model, which was distinguishable by having nine windows instead of eight on each side.

Still fairly early in the type's production career the An-24 was replaced by the An-24V Series I, powered by a pair of 2550-ehp Ivchenko AI-24As. Essentially a scaled-down version of the powerful AI-20, the AI-24 was developed specially for the An-24, and in its AI-24A form can be boosted to 2800 ehp by water injection at the compressor inlet. This modification considerably improved the An-24V Series I's 'hot and high' performance, complementing the revised wing, enlarged from 72.46 m^2 (780 sq ft) to 75 m^2 (807 sq ft) by a centre section of wider chord and enlarged flaps.

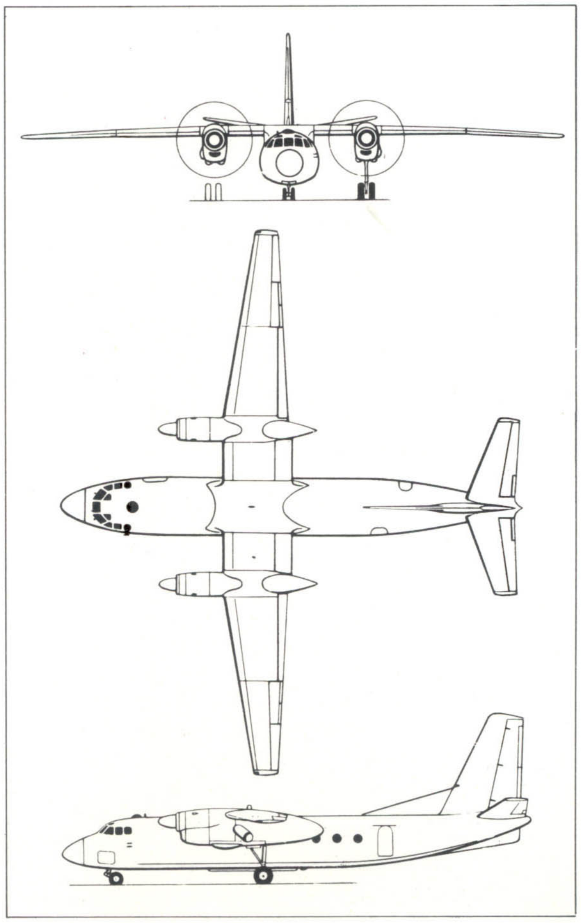
From 1967 production was of a further improved model, the An-24V Series II, presumably introduced to better still more the 'hot and high' performance of the An-24V Series I. This model is fitted with 2820-ehp AI-24T turboprops and, most interestingly, a 900-kg (1984-lb) st Tumanksy RU

19-300 auxiliary turbojet in the rear of the right nacelle in place of the TG-16 auxiliary power unit. The RU 19-300 is optional, and aircraft fitted with it are designated An-24RV. Passenger accommodation on the An-24V Series II aircraft is for a maximum of 52 seated four-abreast. The An-24V Series II is nearing the end of its production run, but is still available in convertible or mixed passenger/ freight configurations.

Antonov have also produced two versions of the An-24V Series II for freight operations. These are the An-24T and An-24RT, basically similar to the An-24V Series II and An-24RV respectively. Like their passenger counterparts, these can take off at altitudes up to 3000 m (9843 ft). Maximum payload is 4612 kg (10 168 lb) for the An-24T, and 5700 kg (12 566 lb) for the An-24RT, and these loads can be handled by means of a large ventral door with an electric winch.

The An-24P is a special model intended for forest fire-fighting, first tested in the autumn of 1971. It is fitted with provision for the dropping of parachutists and fire-fighting equipment.

Other An-24 derivatives are the An-26 freighter, fitted with an enlarged ventral hatch in a new beaver-type tail, and two 2820-ehp AI-24Ts with an RU 19-300 turbojet; the An-30 aerial-survey model derived from the An-24RT/An-26, with four camera ports in the fuselage floor and a glazed nose; and the An-32 'hot and high' transport, fitted with two 5180-ehp Ivchenko AI-20M turboprops enabling the type to operate from airfields up to an altitude of 4500 m (14 764 ft).

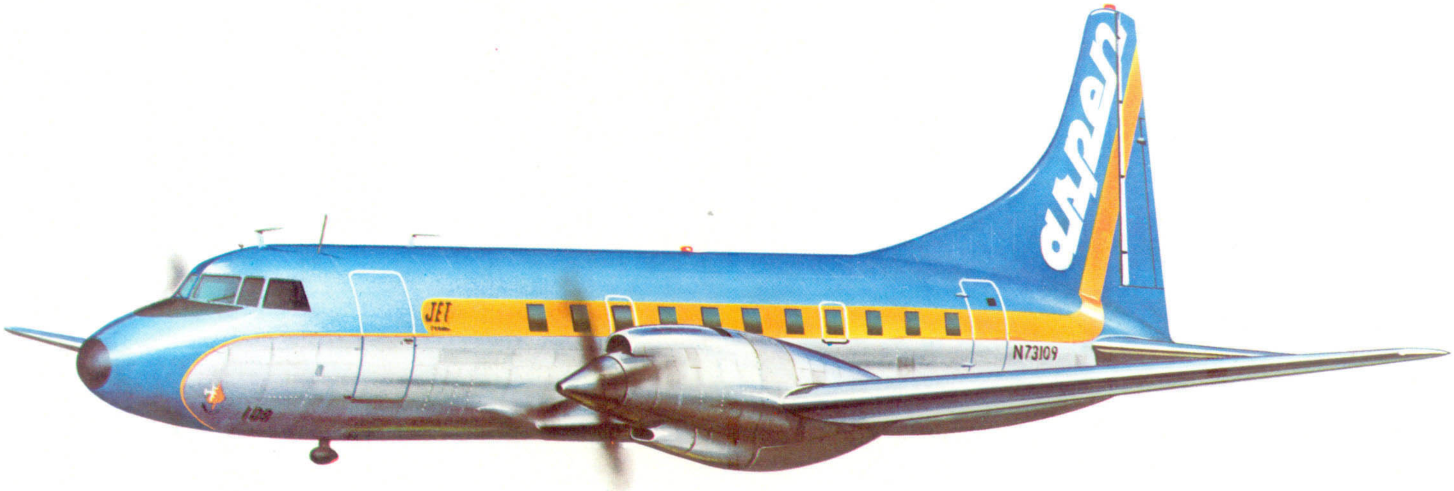


An-24V Series II

Type: short-range transport
Maker: Antonov Design Bureau
Span: 29.2 m (95 ft 10 in)
Length: 23.53 m (77 ft 2 in)
Height: 8.32 m (27 ft 4 in)
Wing area: 75 m^2 (807 sq ft)
Weight: maximum 21 000 kg (46 296 lb); empty 13 300 kg (29 321 lb)
Powerplant: two 2550-ehp Ivchenko AI-24A turboprops
Performance: cruising speed 450 km/h (280 mph) at 6000 m (19 685 ft); range with maximum payload and reserves 550 km (342 miles)
Payload: 5500 kg (12 125 lb); seats for up to 52 passengers
Crew: 3 to 5
Production: 729 ordered by 1980 (An-24, An-26 and An-30)

CV-580, Convair

FIRST FLIGHT 1960



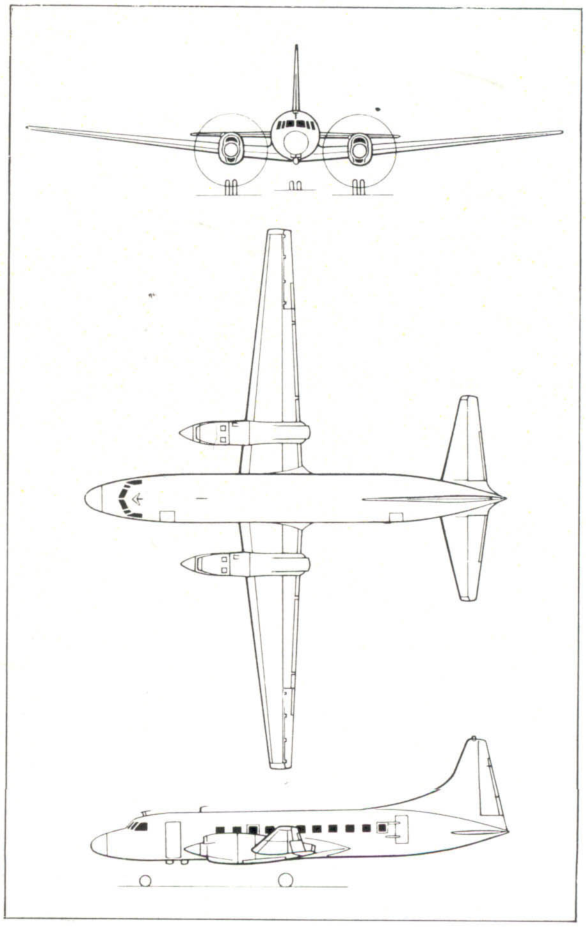
THE Convair 240, 340 and 440 short-range airliners were built between 1947 and 1957 as pressurized replacements for the Douglas DC-3. All three models were built to the same basic design, and were powered by a pair of Pratt & Whitney R-2800 Double Wasp radials. But in the early 1950s Convair came to appreciate the importance of the turboprop, and saw that in its 240, 340 and 440 designs it had an admirable starting point for a simple conversion of existing aircraft to turboprop power.

Convair produced an experimental conversion of a 240 with Allison 501-A2 (T56) turboprops as early as 1950, and though the concept was entirely validated, it was not until 1954 that commercial conversion was considered, in this case by the British engine manufacturer Napier. Re-engined with two 3060-ehp Napier Eland NE. 1 turboprops, the first 340 conversion flew on February 9, 1955 as the Convair 540. This and six other conversions were operated by Allegheny Airlines, while the Royal Canadian Air Force used ten as CL-66Bs, built as such by Canadair, who also produced three conversions.

Though successful, no further Eland conversions were possible as a result of the cancellation of the Eland programme in 1962. Thus the next model was the definitive Convair 580, 130 of which were produced by the installation of 3750-ehp Allison 501-D13 turboprops on Convair 340s and 440s. The conversion was undertaken by Pacific Airmotive, the first re-engined aircraft flying on January 19, 1960. The 580 received its Federal Aviation Administration certification on April 21, and the first delivery was made in May of the same year.

The other major turboprop conversion of the Convair-Liner series was with the Rolls-Royce Dart RDa. 10 Mk 542, rated at 3025 ehp. The conversion of all three members of the family was undertaken by Convair itself, and the revised aircraft were at first designated 240D, 340D and 440D, these subsequently being altered to 600 and 640, the latter covering both the 340D and 440D.

The impetus for the programme came from Central Airlines, who ordered ten Convair 240Ds. The first of these flew on May 20, 1965 and the type entered service on November 30 of the same year; the Convair 340D and 440D programme was contemporary, and the first Convair 640 entered service on December 22, 1965.



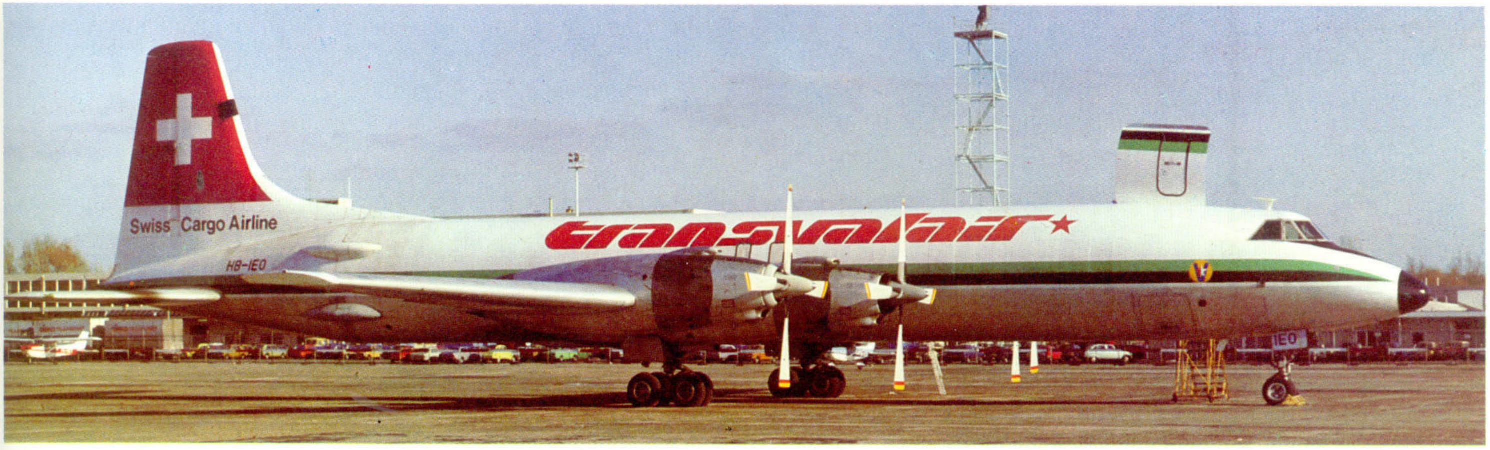
Top: The Convair CV-580 as operated by Aspen Airways of Colorado
Above: A CV-580 of the Cleveland, Ohio-based Wright Air Lines at Atlanta, Georgia in December 1977

CV-580

Type: local service transport
Maker: Convair division of General Dynamics Corporation; Pacific Airmotive Inc
Span: 32.12 m (105 ft 4 in)
Length: 24.84 m (81 ft 6 in)
Height: 8.89 m (29 ft 2 in)
Wing area: 85.47 m^2 (920 sq ft)
Weight: maximum 26 372 kg (58 140 lb); empty approx 13 835 kg (30 500 lb)
Powerplant: two 3750-ehp Allison 501-D13H turboprops
Performance: cruising speed 550 km/h (342 mph); maximum range 4611 km (2865 miles)
Payload: 4023 kg (8870 lb); seats for up to 56 passengers
Crew: 3 to 4
Production: 20 (CV-540), 130 (CV-580), 39 (CV-600) and 28 (CV-640)

CL-44, Canadair

FIRST FLIGHT 1960



DERIVED from the Bristol Type 175 Britannia, the Canadair CL-44 resulted from a Royal Canadian Air Force requirement for a heavy freighter and maritime-reconnaissance aircraft based on the same airframe, and manufactured largely in Canada. As a result, in 1954 Canadair signed a licence agreement with Bristol. The CL-28 Argus reconnaissance aircraft was built between 1957 and 1960, and was followed on Canadair's production line by 12 of the CC-106 Yukon freighters for the RCAF.

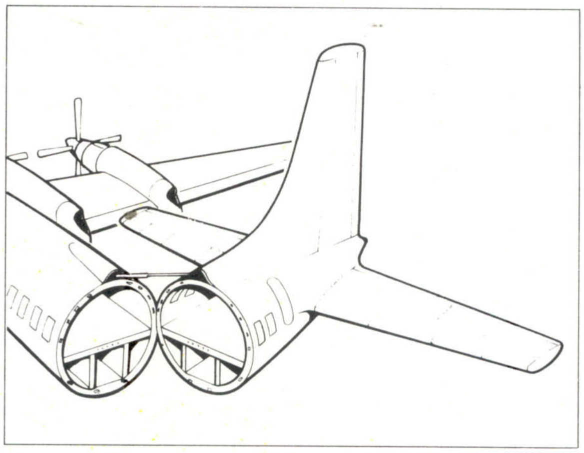
Derived from the Britannia 253 but with a lengthened fuselage, the Yukons had large freight doors on the left side, forward and aft of the wing. Although it was at first planned to engine these aircraft, which had the company designation CL-44D, with Bristol Orion turboprops, the cancellation of the Orion programme in 1958 led to a redesign with Rolls-Royce Tyne turboprops.

With this military commitment running smoothly, Canadair in 1960 turned to the production of a civil counterpart of the Yukon. Designated CL-44D-4, this had the unusual feature of a hinged rear fuselage and tail surfaces. These could be swung to the right, allowing bulky loads and pallets to be loaded straight into the fuselage. The first such aircraft flew on November 16, 1960 and was followed by an initial batch of 17 production examples for Seaboard World Airlines, the Flying Tiger Line and Slick Airways. These same three cargo operators and Loftleidir of Iceland subsequently bought another ten CL-44D-4s, the Loftleidir aircraft being used for low-fare transatlantic flights with up to 178 passengers. Wishing to carry yet more passengers, Loftleidir approached Canadair with a view to a stretched version.

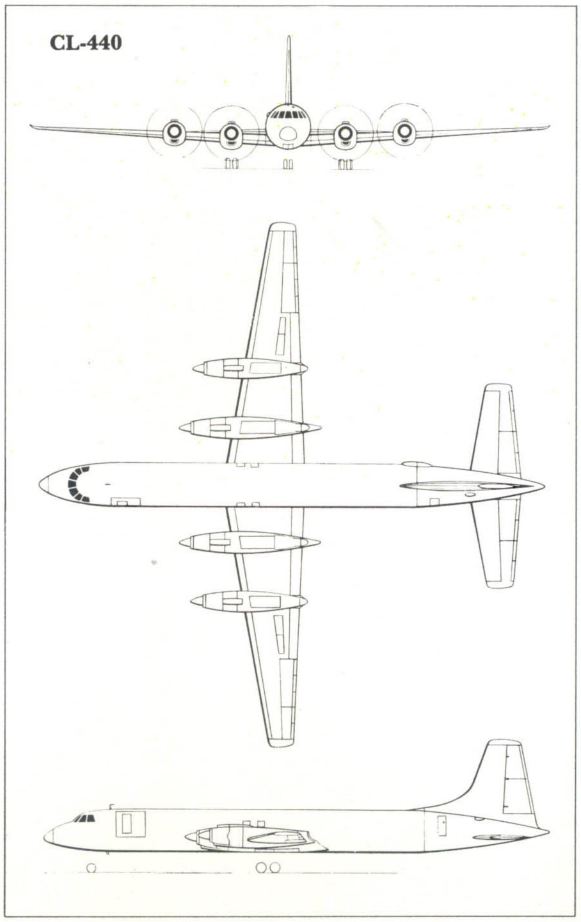
This resulted in the last of Loftleidir's four CL-44D-4s being modified on the production line to Canadair 400 (CL-44J) standard, with its already lengthened fuselage stretched further and seating for 214. Loftleidir's other CL-44D-4s were later converted to the same standard.

The only other CL-44 variant was the CL-440, produced by Conroy Aircraft. This was an ex-Flying Tiger Line CL-44D-4 modified with a bulged upper portion of the fuselage to accommodate loads up to 4.24 m (13 ft 11 in) in height.

The CC-106 Yukons were sold from military service in 1973, and several of them have been bought by civil operators.



Above: HB-IEO, formerly G-AWOV, one of two Canadair CL-44s operated by Transvalair, a Swiss charter firm carrying cargo to Europe, the Middle East, Far East and Africa
Left: The CL-44D-4, the freighter version which had a hinged rear fuselage and tail surfaces for loading bulky cargo and pallet loads

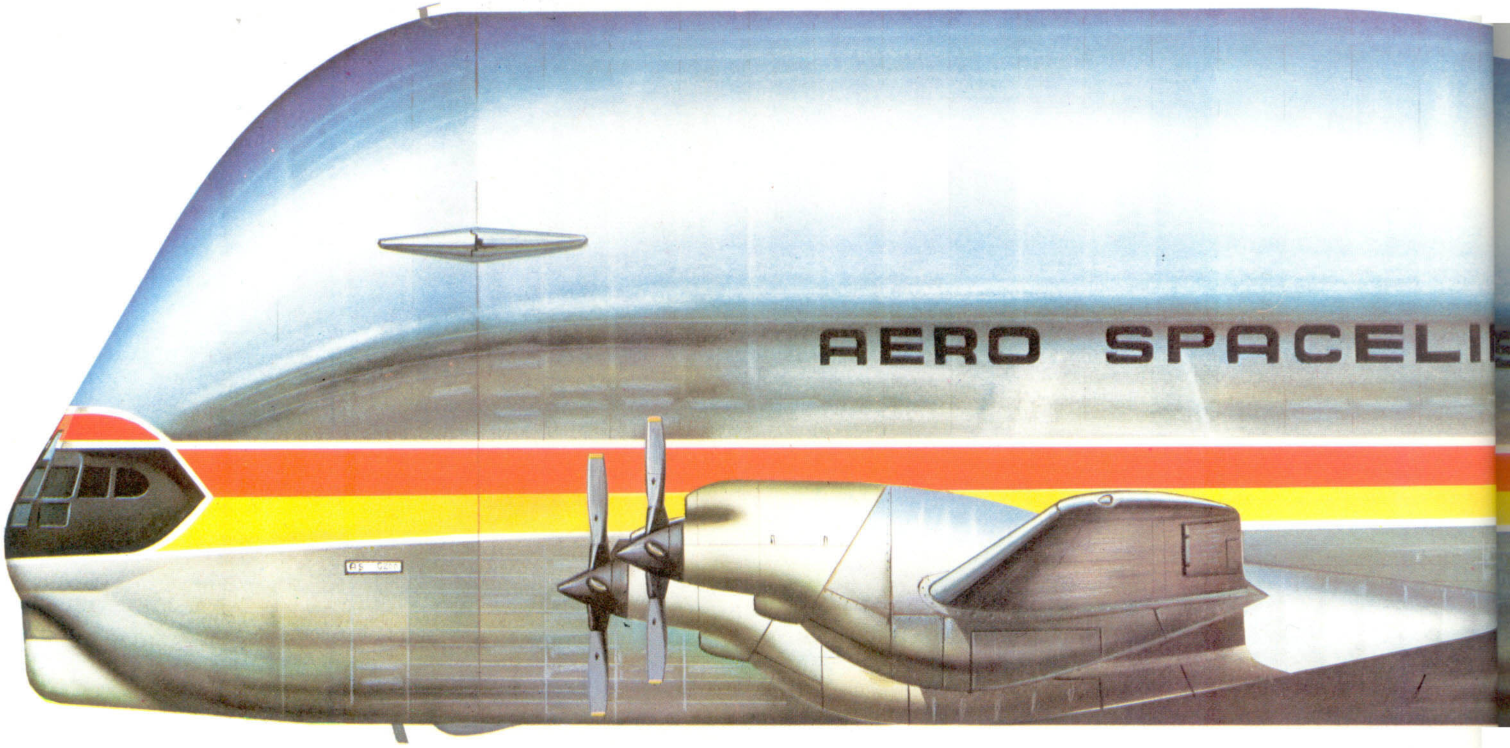


CL-44D-4

Type: long-range freighter
Maker: Canadair Ltd
Span: 43.37 m (142 ft 3½ in)
Length: 41.73 m (136 ft 10¾ in)
Height: 11.79 m (38 ft 8 in)
Wing area: 193 m^2 (2075 sq ft)
Weight: maximum 95 256 kg (210 000 lb); empty 40 348 kg (88 950 lb)
Powerplant: four 5730-ehp Rolls-Royce Tyne Mk 515/10 turboprops
Performance: maximum cruising speed 620 km/h (385 mph) at 6096 km (20 000 ft); range with maximum payload 5246 km (3260 miles)
Payload: 29 995 kg (66 128 lb); seats for up to 178 passengers
Crew: 3
Production: 12 (CL-44D), 27 (CL-44D-4 and CL-44J)

Guppy, Aero Spacelines

FIRST FLIGHT 1962

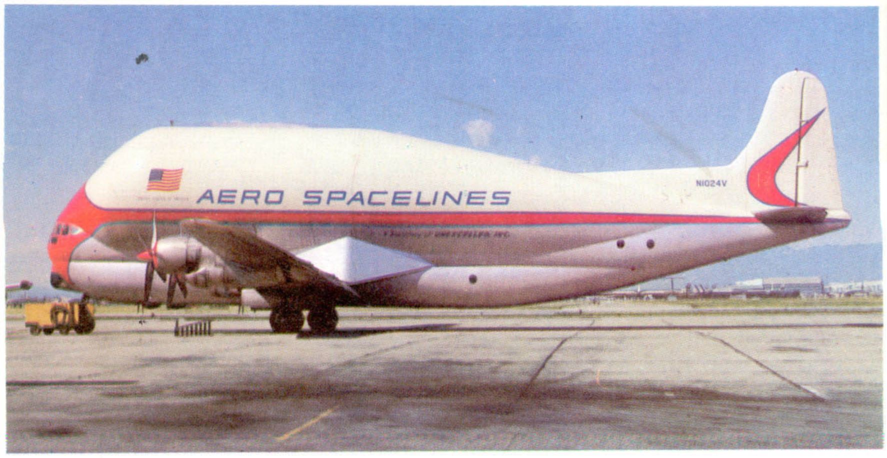


FORMED in 1961, Aero Spacelines existed specifically to produce conversions of the Boeing 377 Stratocruiser and C-97 freighter into high-capacity freighters capable of transporting high-volume hardware, such as boosters, for the US space effort.

The first aircraft to be produced by the company was the Pregnant Guppy, which made its initial flight on September 19, 1962. Formally designated B-377PG, the Pregnant Guppy retained the flying surfaces and 3500-hp Pratt & Whitney R-4360 Wasp Major piston engines of the C-97, but had a highly bulged upper lobe fitted to the fuselage, which was also stretched by 5.08 m (16 ft 8 in). The whole of the rear fuselage and empennage could be detached for the straight-loading of booster stages.

Next appeared the B-377SG Super Guppy, which first flew on August 31, 1965. This was based on a Boeing C-97J, but was more extensively modified than the Pregnant Guppy. The radial engines were replaced by 7000-ehp Pratt & Whitney T34-P-7WA turboprops, wing span was increased by 4.57 m (15 ft) and the fuselage by 9.4 m (30 ft 10 in). The yet larger upper lobe could accommodate loads up to 7.62 m (25 ft) in diameter.

Although both the Pregnant and Super Guppies had been produced entirely as commercial enterprises, both aircraft were contracted for the exclusive use of the National Aeronautics and Space Administration (NASA) and US Department of Defense, and so Aero Spacelines turned to further conversions to meet the needs for a commercial bulky freight transport.

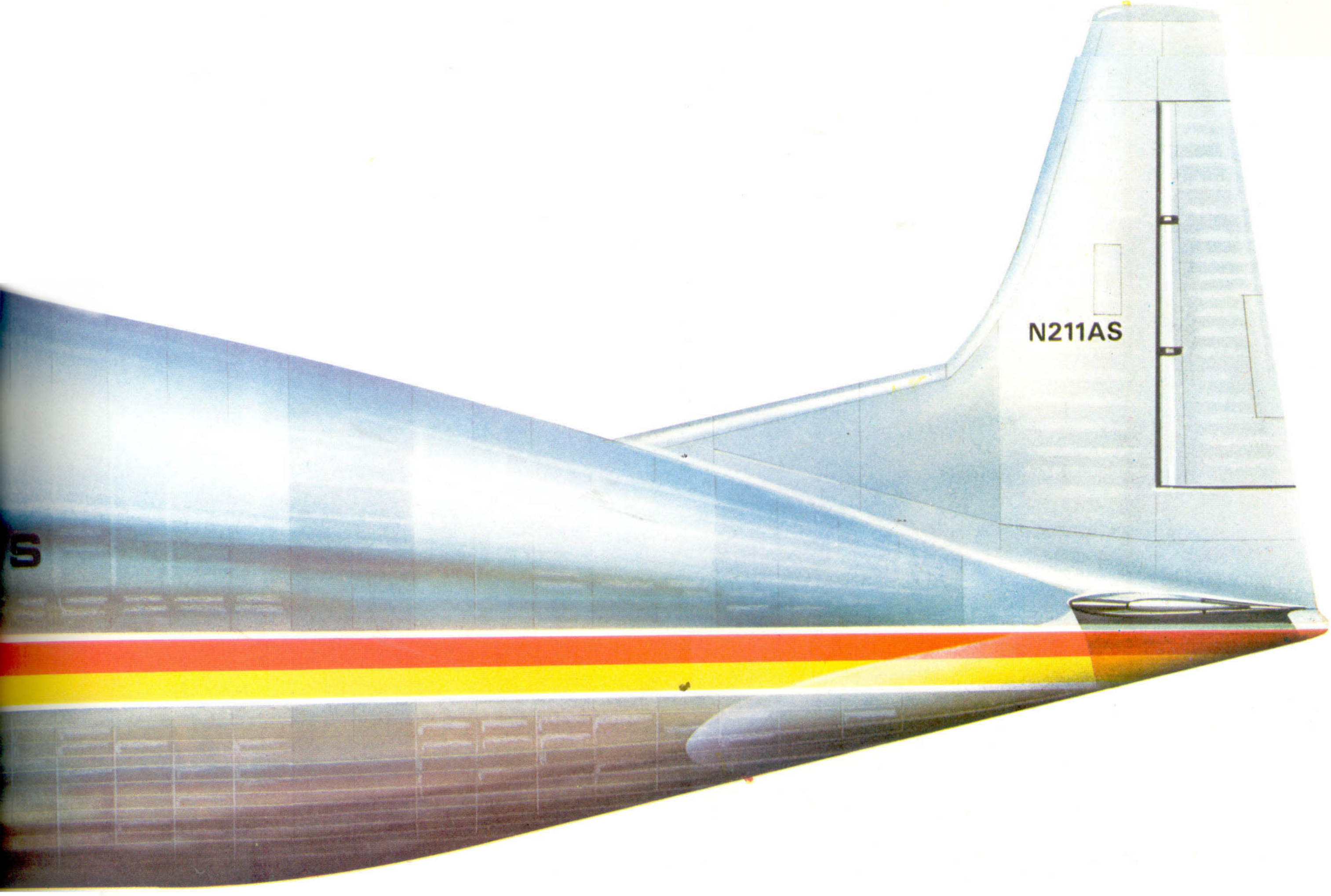


The B-377MG Mini Guppy 'reverted' to piston engines, in this instance four 3800-hp Pratt & Whitney R-4360-B6 Wasp Majors. Derived from a Stratocruiser, but fitted with a wider and longer fuselage and a hinged tail section, the Mini Guppy first flew on May 24, 1967. The B-377MG was lost in a crash on May 12, 1970.

Next to appear, on March 13, 1970, was the Guppy-101, derived from a Stratocruiser, but powered by four 4912-shp Allison 501-D22C turboprops. The Guppy-101 also introduced a new feature to the family: a hinged nose in place of the earlier detachable or hinged rear fuselage and tail unit.

Finally there appeared the Guppy-201, or B-377SGT. Design of this aircraft (intended for the

Top: The Super Guppy which was built by Aero Spacelines to carry cargo such as launchers in the US space programme
Above: The Pregnant Guppy which can carry a complete Saturn S-IV second stage of the Apollo moon rocket
Right: A dramatic view of a Super Guppy at Bergstrom Air Force Base, Austin, Texas. The Stratocruiser cockpit can be seen clearly in this view
Far right: Side elevations showing the development of the Guppy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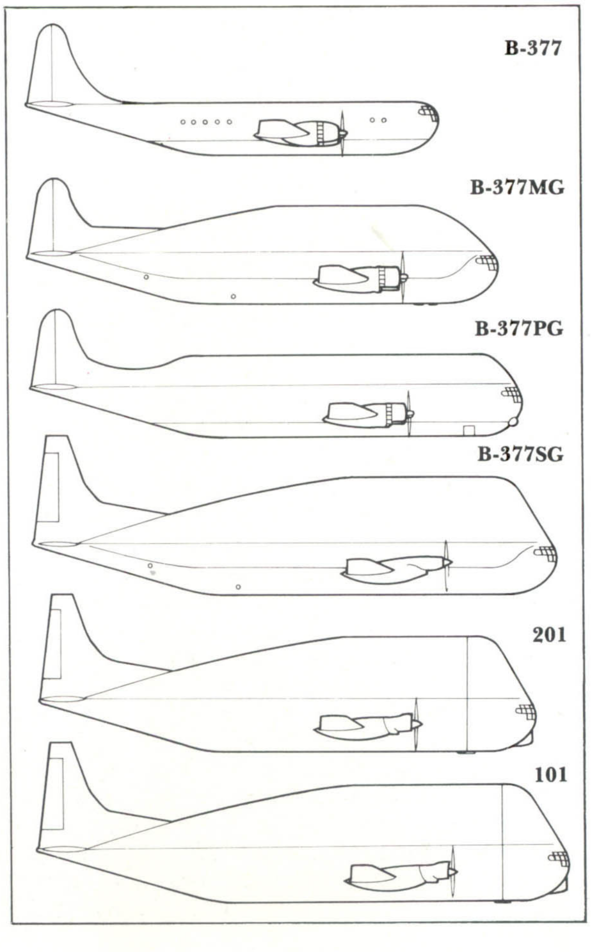
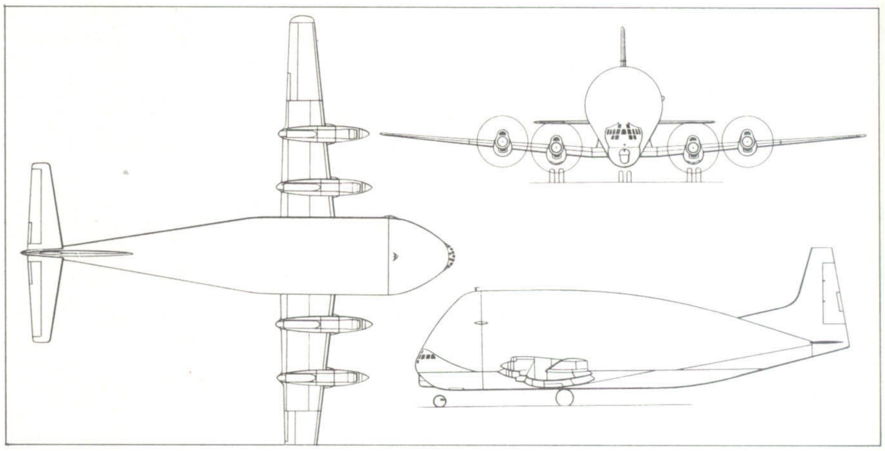

B-377
B-377MG
B-377PG
B-377SG
201
101

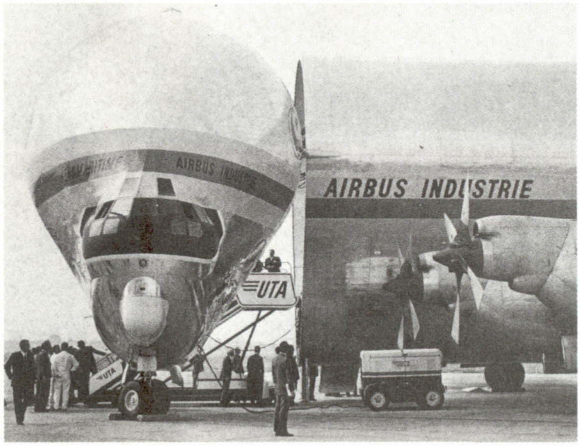
carriage of major airframe components of machines such as the Airbus A300, BAe/Aérospatiale Concorde, Lockheed TriStar and McDonnell Douglas DC-10) was begun in January 1968. Construction of the first Guppy-201 began in September 1969, using standard portions of the B-377/C-97 family such as the wings, tail unit, cockpit and lower fuselage. (Parts of several lower fuselages had to be joined to produce the necessary length.)

In essence the Guppy-201 is a Super Guppy re-engined with Allison 501-D22C turboprop engines. Two examples were planned originally, these first flying on August 24, 1970 and August 24, 1972 respectively. US Federal Aviation Administration Type Approval was granted on August 26, 1971. Both Guppy-201s were quickly bought by Aérospatiale for operation by Aéromaritime to ferry major sub-components of the A300B and Concorde from local assembly factories to the final assembly locations at Toulouse.

The cargo hold of the Guppy-201 has a floor width of 3.96 m (13 ft), bulging out to a maximum width of 7.65 m (25 ft 1 in) before curving in once again prior to reaching the compartment's ceiling 7.77 m (25 ft 6 in) above the floor. The hold's length is 33.99 m (111 ft 6 in), though only 9.75 m (32 ft) of this has a constant section. Access to this volume of 1104 m^3 (39 000 cu ft) is through the hinged nose section, which swings back through 110° to ensure unimpeded loading and unloading.

There currently appears to be every likelihood of further Guppy-201 production meet Airbus Industries' need for increased output.





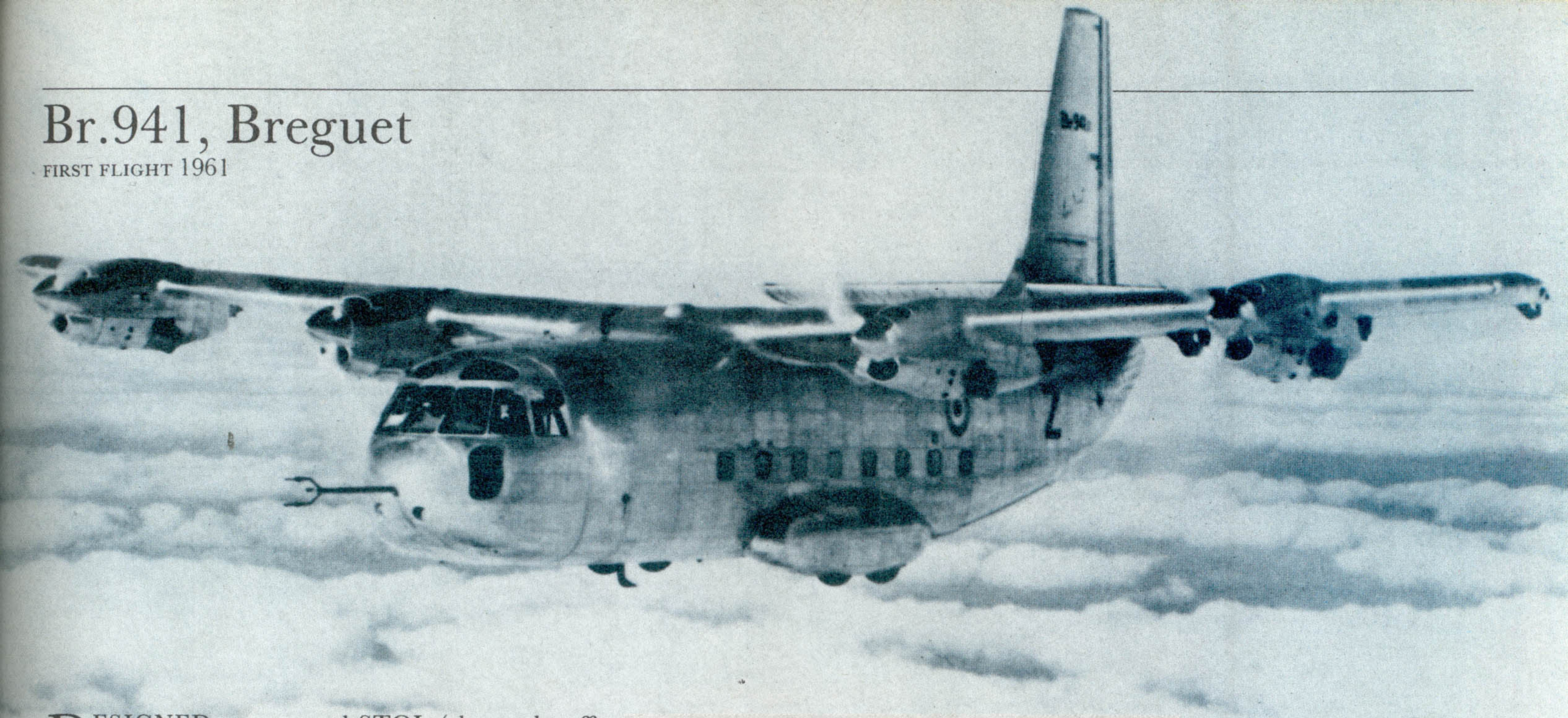
Guppy-201

Type: bulky freight transport
Maker: Aero Spacelines Inc; Airbus Industrie
Span: 47.62 m (156 ft 3 in)
Length: 43.84 m (143 ft 10 in)
Height: 14.78 m (48 ft 6 in)
Wing area: 182.55 m^2 (1965 sq ft)
Weight: maximum 77 111 kg (170 000 lb); empty 45 360 kg (100 000 lb)
Powerplant: four 4912-ehp Allison 501-D22C turboprops
Performance: maximum cruising speed 463 km/h (288 mph) at 6096 m (20 000 ft); range with maximum payload 813 km (505 miles)
Payload: 24 494 kg (54 000 lb)
Crew: 3 to 4
Production: 1 (Pregnant Guppy), 1 (Super Guppy), 1 (Guppy-101), 4 (Guppy-201) by 1980, 1 (Mini Guppy)

Above left: An Aero Spacelines Guppy in service with Aéromaritime serving the Airbus Industrie consortium. By 1984 Airbus hopes to have built two more of these outsize freighters
Left: An Airbus Guppy at Reykjavik in 1978. In 1980 two were used to ferry Airbus parts from partner factories to Toulouse for assembly

Br.941, Breguet

FIRST FLIGHT 1961

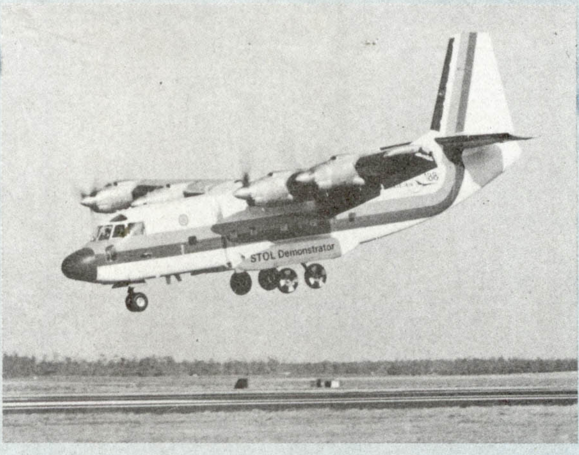


DESIGNED as a rugged STOL (short take-off and landing) transport for both civil and military operators, the Breguet 941 was a relatively unsophisticated aircraft in structure and capabilities. It was, however, provided with an extensive deflected-slipstream STOL system. In this, the slipstream of four large-diameter propellers driven by engines located evenly along the leading edges of the wing blew over the entire span of the wings before being turned downwards by the double-slotted full-span trailing-edge flaps, the rear member of which was fitted with a fixed leading-edge slat. To ensure a smooth and consistent airflow in the event of engine failure, the four engines were mechanically linked by a high-speed transmission shaft through the wings.

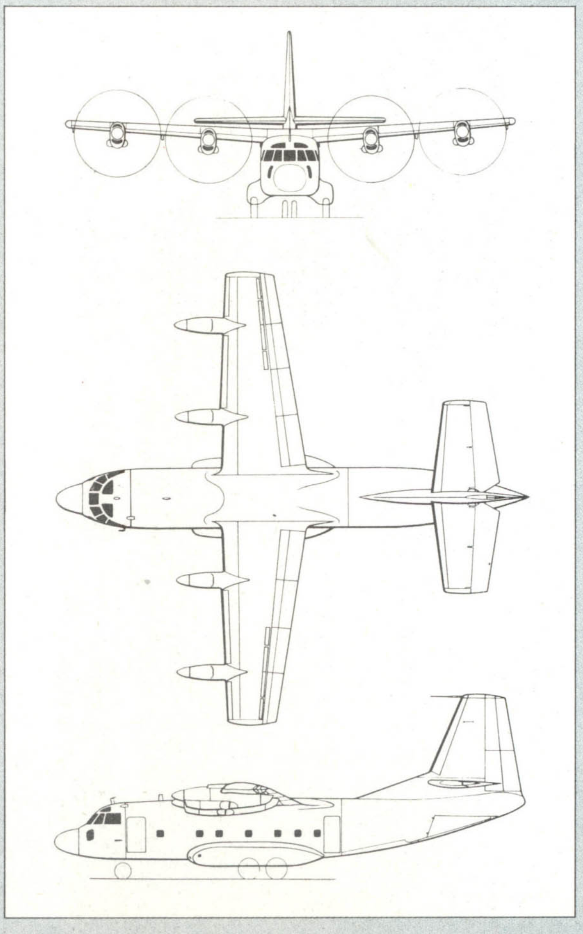
The prototype Breguet 941 first flew on June 1, 1961, this aircraft having been produced in response to a French air force order of February 22, 1960. At this time, Breguet's thoughts were turned to two basic models, the Br.941C civil model with a retractable airstair in place of the ventral ramp for the boarding of passengers, and the Br.941M military freight model. Extensive flight trials followed, and in November 1965 the French government ordered four pre-production aircraft, designated Br.941S, together with the tooling and jigging needed for large-scale production. These four aircraft were powered by 1500-shp Turboméca Turmo IIID$_3$ (later IIID$_6$) turboprops in place of the 1250-shp Turmo IIIDs of the prototype, and also differed from the prototype in having larger nose radomes, a wider cargo hold and a revised rear ramp configuration. The first Br.941S flew on April 19, 1967 and was soon joined by the three other pre-production. The original Br.941 was also re-engined to take part in the trials programme.

US interest in the type was evinced by an offer from McDonnell Aircraft to co-operate in the project. To this end the prototype was tested in the United States during 1964 and 1965. Neither of the two US airlines to test the type, Eastern Air Lines and American Airlines, ordered the McDonnell aircraft, designated Model 188, effectively halting the McDonnell initiative.

Changing requirements, coupled with the availability of the Nord Noratlas and Transall C-160 for military use, finally led to the end of the Br.941 programme in France during the early 1970s.



Above: The prototype Br.941 in French air force insignia. It was envisaged as a civil or military transport
Left: The McDonnell Model 188 demonstrates its STOL (short take-off and landing) performance during trials at American cities in the mid 1960s



Br.941S

Type: STOL utility transport
Maker: Breguet Aviation
Span: 23.4 m (76 ft 8½ in)
Length: 23.75 m (77 ft 11 in)
Height: 9.65 m (31 ft 8 in)
Wing area: 83.78 m^2 (902 sq ft)
Weight: maximum 24 500 kg (58 422 lb); empty 14 700 kg (32 408 lb)
Powerplant: four 1500-shp Turboméca Turmo IIID$_6$ turboprops
Performance: maximum cruising speed 417 km/h (259 mph) at 3050 m (10 000 ft); range with maximum payload 1000 km (621 miles)
Payload: 10 000 kg (22 046 lb); seats for up to 57 passengers
Crew: 3
Production: 5

YS-11, NAMC

FIRST FLIGHT 1962

DESPITE the fact that it was built only in relatively small numbers, the Nihon Kokuki Seizo Kabushiki Kaisha (Nihon Aeroplane Manufacturing Company) YS-11 twin-turboprop airliner has the unique distinction of being the first, and so far the only, Japanese civil transport to have been produced in substantial numbers, apart from types of foreign origin dating from before and during World War II.

Work on the concept which was to appear as the YS-11 began in 1956, when the Ministry of International Trade and Industry called for a short- and medium-range airliner. With the aid of a government subsidy, design work under the leadership of Dr Hidemasa Kimura was started, overall control of the project being vested in the Transport Aircraft Development Association, superseded in 1959 by the NAMC.

This controlling body, 54% government owned, was responsible for design, sales and production control, while production itself was vested in a consortium of six companies: Fuji Heavy Industries for the tail, Japan Aircraft Manufacturing for the ailerons and flaps, Kawasaki Aircraft for the main wings and engine nacelles, Mitsubishi Heavy Industries for the main fuselage and final assembly, Shin Meiwa Industry for the rear fuselage, and Showa Aircraft Industry for the honeycomb components such as doors. The proportion of the total aircraft produced by each company reflected its percentage holding in the 46% of the NAMC left in private hands.

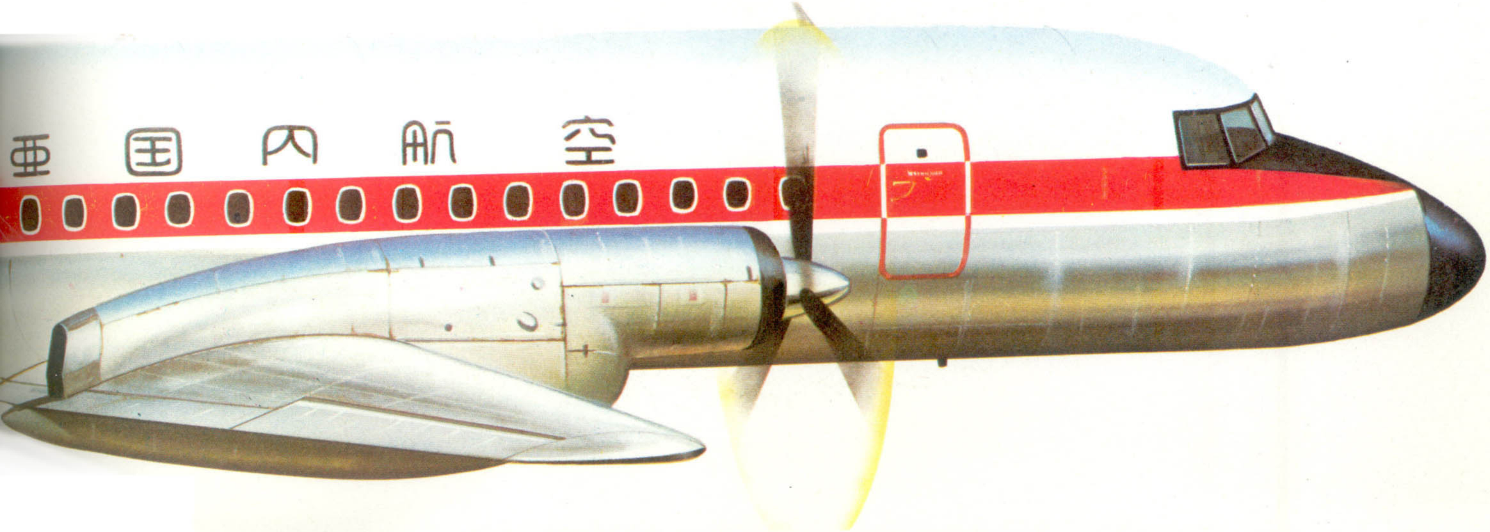
Though substantial foreign sales were hoped for, the design parameters most closely applied during the design phase were the needs of Japan's growing domestic air routes. This meant that although the YS-11 was yet another contender in the Douglas DC-3 replacement field, it was intended to carry a substantially larger payload than aircraft such as the Fokker F27, the Handley Page Herald and the Hawker Siddeley 748.

For ease of loading a low-wing layout was selected, accommodation for a basic payload of 60 passengers was provided, and the powerplant selected was a pair of Rolls-Royce Dart RDa. 10/1 turboprops, the model being specially developed for the YS-11 and preferred to the Allison 501 and Napier Eland.

Construction of two flying and two static-test

Above: A YS-11 under evaluation by Japanese airlines during a visit to a British airport
Right: A YS-11 of Hawaiian at Honolulu International Airport
Below: The YS-11 in TOA livery; the type is used by All-Nippon Airways, Southwest Air Lines and TOA Domestic Airlines, which link the cities and islands of Japan

HAWAIIAN
N1145H

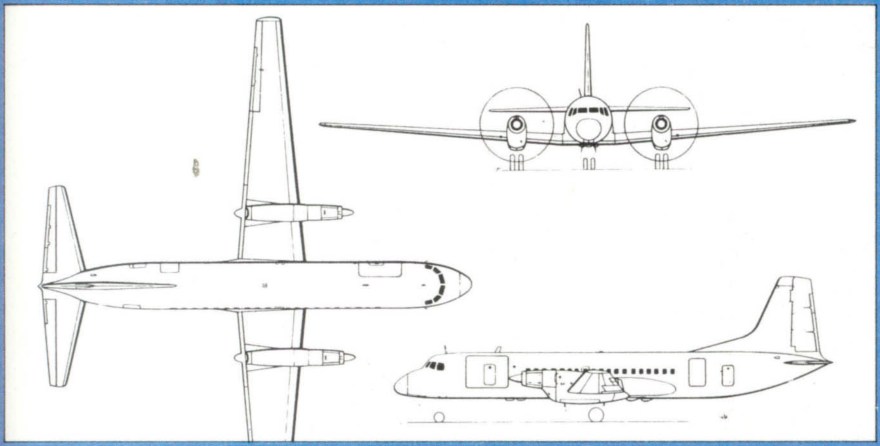

亜国内航空

prototypes began in May 1957 with the formation of the Transport Aircraft Development Association. The first prototype flew on August 30, 1962, with the second following on December 28 of the same year. Intensive flight trials yielded the YS-11 its Japanese Civil Aviation Bureau type certificate on August 25, 1964, and its US Federal Aviation Administration Type Approval on September 7, 1965.

Production had meanwhile started, and the first production aircraft flew on October 23, 1964. It was delivered to the Japanese Civil Aviation Bureau in March 1965. The first airline user was Toa Airways, operating the first YS-11 scheduled service in April 1965, followed by Japan Domestic in May and by All Nippon in July 1965.

Perhaps reflecting the strong domestic elements in the design, sales of the YS-11 to foreign operators were initially slow, Filipinas Orient buying two YS-11s in September 1965, Hawaiian Airlines three in 1966, and LANSA (Peru) three in 1967. There foreign sales faltered, and NAMC thus felt it essential to try for a breakthrough into the lucrative US market. The Charlotte Aircraft Corporation were appointed sole agents in the United States, and largely as a result of the agency's recommendations there appeared the YS-11A stretched model, available in three sub-types.

All three models have the same basic dimensions as the YS-11, as well as the water-methanol-injected hot high Dart Mk 542 engines. The most successful of the whole YS-11 family, the YS-11A-



YS-11A

Type: short- and medium-range transport
Maker: Nihon Aeroplane Manufacturing Co
Span: 32 m (105 ft)
Length: 26.3 m (86 ft 3½ in)
Height: 8.99 m (29 ft 6 in)
Wing area: 94.8 m^2 (1020 sq ft)
Weight: maximum 24 500 kg (54 013 lb); empty 15 050 kg (33 179 lb)
Powerplant: two 3060-ehp Rolls-Royce Dart Mk 542 turboprops
Performance: cruising speed 472 km/h (293 mph) at 4572 m (15 000 ft); range with maximum payload and reserves 346 km (215 miles)
Payload: 6949 kg (15 320 lb); seats for up to 64 passengers
Crew: 4
Production: 182

200 reached a production total of more than 90. With seating for 60 passengers in normal operations, the YS-11A-200 had higher operating weights, and the payload was increased by some 1270 kg (2800 lb) to 6949 kg (15 320 lb). As in the basic YS-11, seating was five-abreast. Ordered initially by Piedmont Airlines, which as Piedmont Aviation finally operated some 17 of the type, the YS-11A-200 first flew on November 27, 1967, with initial deliveries beginning during 1968. Subsequently the model entered service with eight other airlines.

The next model was the YS-11A-300CP, a mixed-traffic derivative of the YS-11A-200. This had a large freight door (2.5 m [8 ft 2 in] by 1.83 m [6 ft]) in the left side of the forward fuselage, leading into a forward freight hold with a volume of 10 m^3 (360 cu ft). Behind this is accommodation for 46 passengers, together with another 5 m^3 (176 cu ft) of cargo space. Production of the YS-11A-300CP totalled 16.

Subsequent production was of the YS-11A-400 freight model, with a storage volume of 79 m^3 (2790 cu ft) and a large loading door, measuring 3.05 m (10 ft) by 1.83 m (6 ft) aft of the wing trailing edge.

The YS-11A-400 was intended for military use, and the first of the type flew on September 17, 1969. Final production was of the YS-11A-500, -600 and -700, basically similar to the YS-11A-200, -300 and -400 but with maximum take-off weight raised by 500 kg (1102 lb).

Above: JA-8733, a YS-11 of All-Nippon, comes in to land at Fukuoka, Japan in March 1978. In 1980 All-Nippon were operating 30 examples of this short-haul turboprop

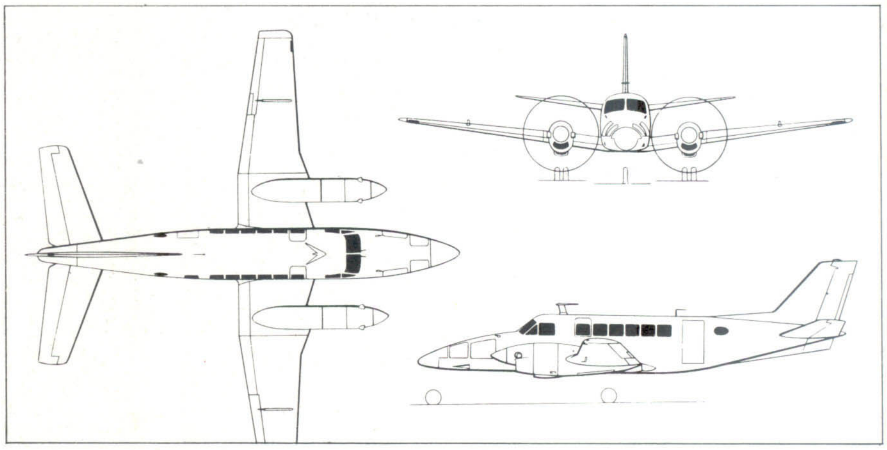
Beech 99 Airliner

FIRST FLIGHT 1965

THE Beechcraft B99 Airliner was in its day the largest aircraft produced by Beech, perhaps the world's best known manufacturer of twin-engined light aircraft. Derived closely from the Beechcraft Queen Air B80 and Queen Airliner B80, the unpressurized B99 Airliner was designed to meet the specific requirements of third-level commuter service operators and air-taxi concerns by lengthening the fuselage to provide more accommodation, and by fitting two turboprops in place of the B80's twin Lycoming piston engines.

To provide the passenger accommodation needed for the new type's role, the basic fuselage of the B80 was lengthened by 3.07 m (10 ft 0¾ in) from 10.82 m (35 ft 6 in), thus increasing seating from the nine of the Queen Airliner B80 to the 15 of the 99 Airliner series, with a longitudinal row of eight seats on the right side of the fuselage, and seven seats on the left side. An airstair door is located in the left side of the rear fuselage. Also available as an option is a cargo door just forward of the passenger door, to provide operators with the capability of using their aircraft as mixed freight-passenger carriers. Another option is a ventral freight and baggage pod, with a capacity of 1.01 m^3 (35½ cu ft) and up to a weight of 363 kg (800 lb).

The aerodynamic prototype of the 99 series was a converted Queen Air, which was first flown in December 1965. Fitted with 550-ehp Pratt & Whitney Aircraft of Canada PT6A-20 turboprops, this aircraft became the definitive 99 Airliner prototype in July 1966. Progress of the type towards US Federal Aviation Administration Type Approval was leisurely, this not being granted until May 2, 1968. On the same day Beech delivered the first production aircraft.



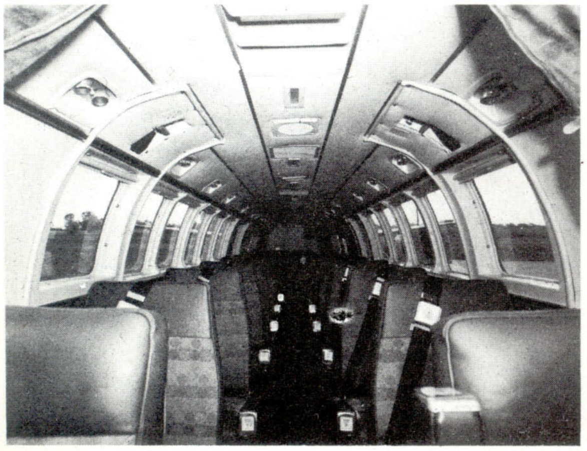
First deliveries were of the 99 Airliner model, powered by 550-ehp PT6A-20 turboprops. The next production variant was the 99A Airliner, with a pair of PT6A-27 turboprops, normally rated at 680-ehp each, but in this instance derated to 550 ehp. The same powerplant was used in the A99A Airliner, which introduced a number of detail modifications. Finally in the definitive B99 Airliner, fully rated PT6A-27s were introduced.

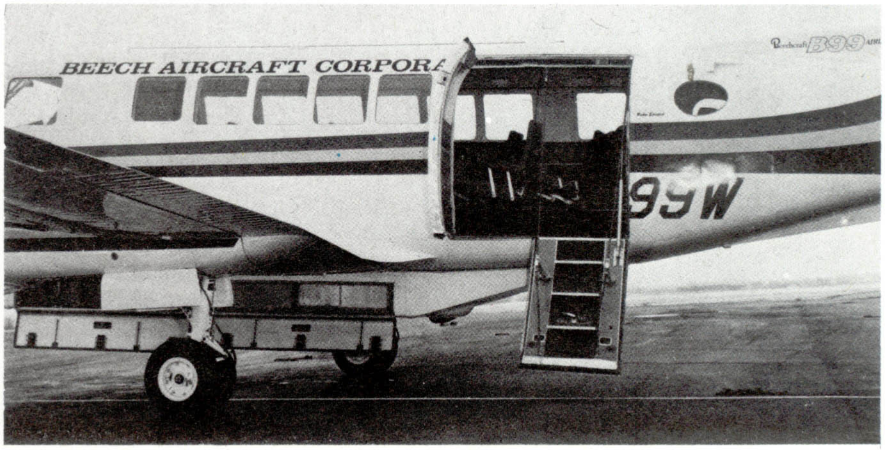
The same basic aircraft was also produced as the B99 Executive, with a variety of internal layouts suiting the aircraft for the carriage of between 8 and 17 corporate officers.

B99 Airliner

Type: short- and medium-range light transport
Maker: Beech Aircraft Corporation
Span: 14 m (45 ft 10½ in)
Length: 13.89 m (45 ft 6¾ in)
Height: 4.38 m (14 ft 4¼ in)
Wing area: 26 m^2 (280 sq ft)
Weight: maximum 4944 kg (10 900 lb); empty 2620 kg (5777 lb)
Powerplant: two 680-ehp Pratt & Whitney Aircraft of Canada PT6A-27 turboprops
Performance: maximum cruising speed 451 km/h (280 mph) at 2438 m (8000 ft); range with maximum payload and reserves 853 km (530 miles)
Payload: seats for up to 15 passengers
Crew: 2
Production: 164

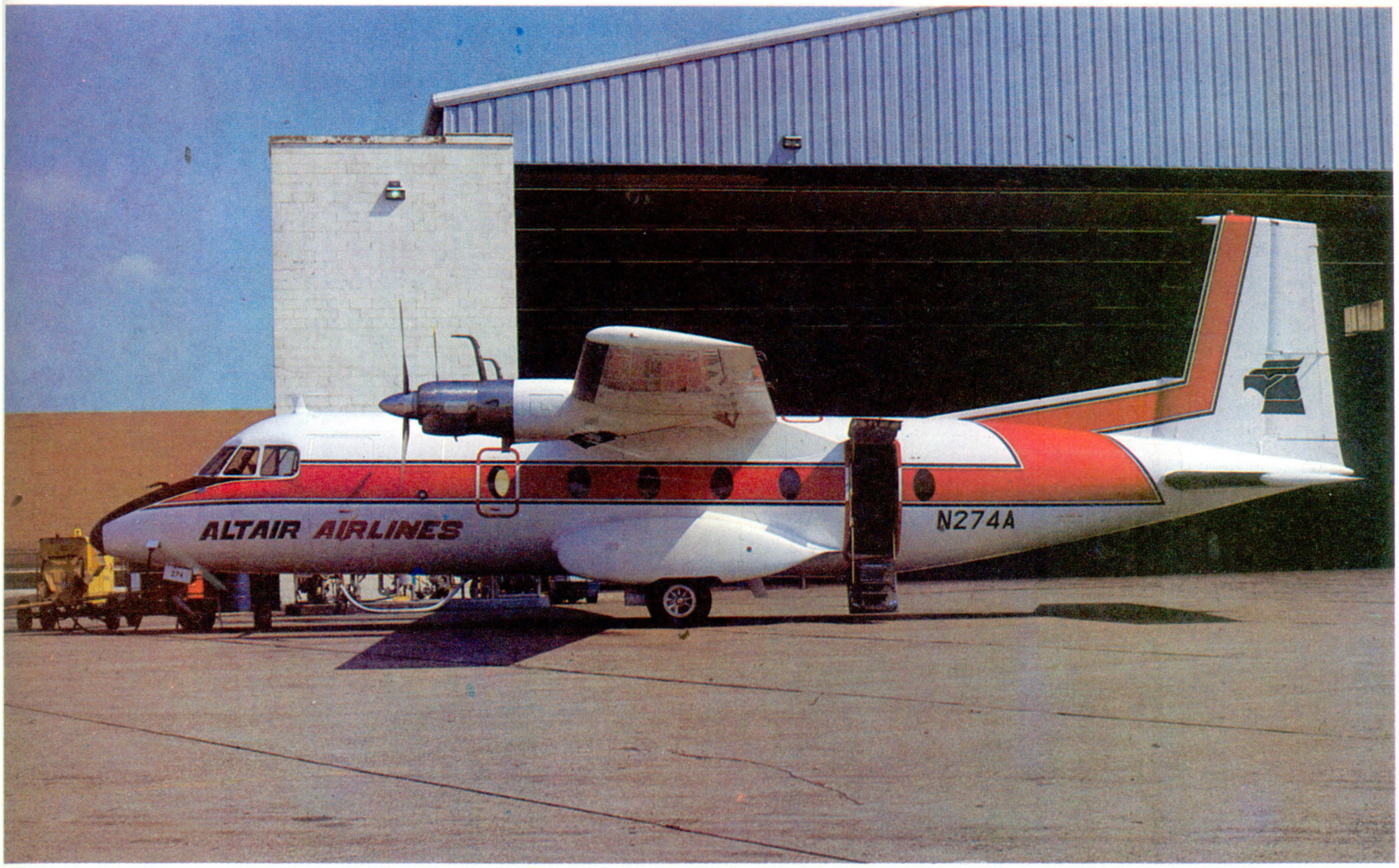
Left: A Beech 99 in its manufacturers livery
Below left: The accommodation for 15 passengers
Below: The airstair and under-fuselage baggage pod open. These facilities are useful in a third-level airliner





Nord 262, Nord-Aviation

FIRST FLIGHT 1962



Above: A Nord 262A of Altair Airlines of Philadelphia, Pennsylvania. This aircraft was previously operated in Denmark

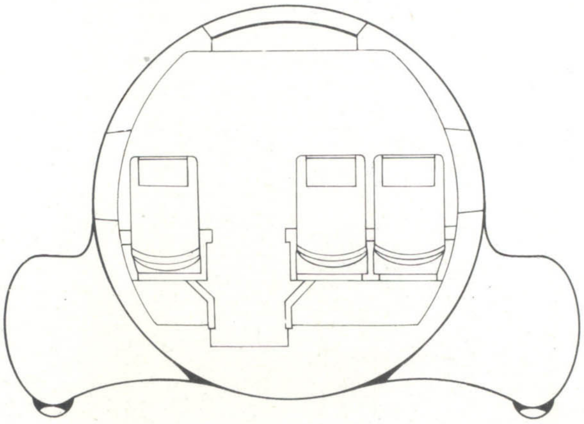
THE origins of the Nord-Aviation 262 lie with the Holste MH.260 Super Broussard, itself evolved from the MH.250 prototype. The latter, designed as a small utility aircraft, was powered by a pair of Pratt & Whitney Wasp radial piston engines, replaced in the MH.260 by two 960-shp Turboméca Bastan turboprops.

Design of the N 262 began in earnest in the first quarter of 1961, the object being to produce a small but comfortable airliner suitable for regional operators flying routes up to 1000 km (621 miles) and able to operate from poor airfields. In this latter respect, the simple tricycle undercarriage of the Super Broussard, with its main units retracting into fuselage blisters, was well suited, as was the high-wing layout.

The prototype N262 first flew on December 24, 1962, and was supplemented in the trials programme by three pre-production aircraft. The N 262's French certificate of airworthiness was granted on July 16, 1964. The first production aircraft had flown some eight days earlier, and this was soon in service with the type's first scheduled operator, Air Inter.

Paradoxically, the first four aircraft (all for Air Inter) were N 262 Series B machines and it was one of these four which flew the first service on July 24, 1964. Subsequent N 262s of the early production types were Series A aircraft, with minor improvements but the same 1080-ehp Turboméca Bastan VIC turboprops. Production of the N 262 Series A totalled 72 aircraft, the first flying early in 1965. This received its US Federal Aviation Administration Type Approval on March 15, 1965, and the initial production N 262 Series A entered service with Lake Central Airlines during late August 1965 after delivery on August 17.

Lake Central Airlines bought 12 N 262As, which continued in service after the company was bought by Allegheny Airlines. In 1974 Allegheny initiated a programme whereby the company's Mohawk Air Services subsidiary contracted with Frakes Aviation for the installation in the nine surviving N 262As of 1180-shp Pratt & Whitney Aircraft of Canada PT6A-45 turboprops, thus making the aircraft Mohawk 298s. The first conversion flew on January 7, 1975 and the type entered service with Allegheny early in 1977. The Mohawk 298 also has new wingtips to improve low-level performance



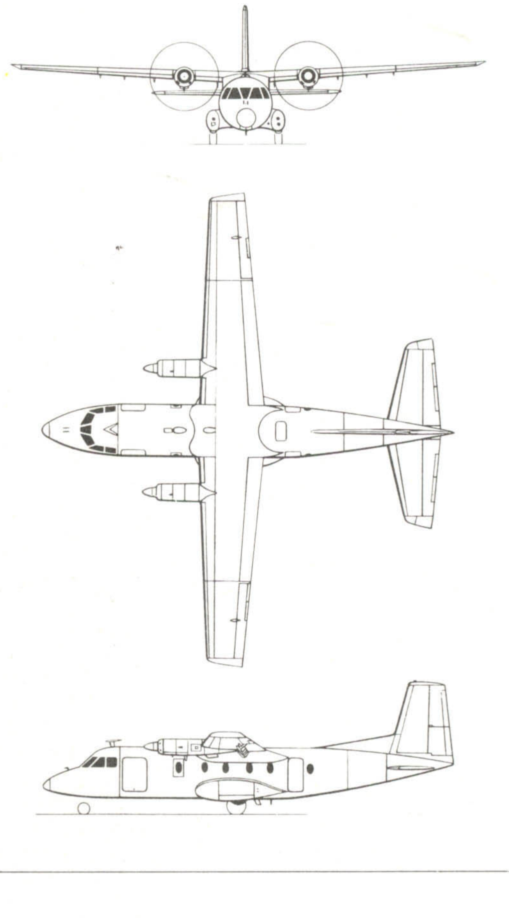
Below left: The Nord 262 uses the simple tricycle landing gear of the Super Broussard, housed in fuselage blisters, but introduced a pressurized fuselage of circular section. Bulkheads had to be cut away above and below to provide headroom

and handling, and it certificated with up to 30 passengers, or a payload of 3402 kg (7500 lb).

On January 1, 1970 Nord-Aviation and Sud-Aviation merged to become the Société Nationale Industrielle Aérospatiale, and subsequent development of the N 262 was undertaken by this new company. Two new variants, the N 262 Series C and Series D, were produced, both models later being given the common name Frégate. The main difference between these two models and their predecessors was the installation of 1145-ehp Bastan VII turboprops in place of the lower-powered Bastan VICs, and an increase in span of 0.7 m (2 ft 3½ in) with new wingtips designed to improve low-speed handling. The two new features were test flown on a converted N 262A from July 1968, and production began in 1970, the types being certificated on December 24, 1970. The two Frégate types are basically similar, the former Series C aircraft being intended for civil operators, and the Series D for military users. Of the 33 Frégates built, 24 went to the French air force.

The effect of the more powerful engines has been a general increase in the Frégate's performance and capabilities compared with the N 262, though payload has been reduced by 195 kg (430 lb). Speed is increased by 33 km/h (20½ mph), rate of climb is better, and maximum fuel range is 270 km (168 miles) greater.

Production of the N 262 and Frégate ended in 1976, despite Aérospatiale's proposal of a revised version, the N 262A-II, with improved performance and capabilities.



Above: A Nord 262 in the livery of Allegheny Airlines of Washington, DC
Right: An N262B of Touraine Air Transport; it was previously registered as F-WLHS. TAT has two N262s on its books, and operates an inter-city service within north and eastern France

Nord 262A

Type: short-range light transport
Maker: Nord-Aviation; Société Nationale Industrielle Aérospatiale
Span: 21.9 m (71 ft 10 in)
Length: 19.28 m (63 ft 3 in)
Height: 6.2 m (20 ft 4 in)
Wing area: 55 m² (592 sq ft)
Weight: maximum 10 600 kg (23 369 lb); empty 6763 kg (14 910 lb)
Powerplant: two 1080-ehp Turboméca Bastan VIC turboprops
Performance: maximum cruising speed 375 km/h (233 mph); range with 26 passengers and reserves 975 km (606 miles)
Payload: 3270 kg (7209 lb); seats for up to 29 passengers
Crew: 2
Production: 77 (N 262) and 33 (Frégate)

N29802
ALLEGHENY

F-BLHS
TAT

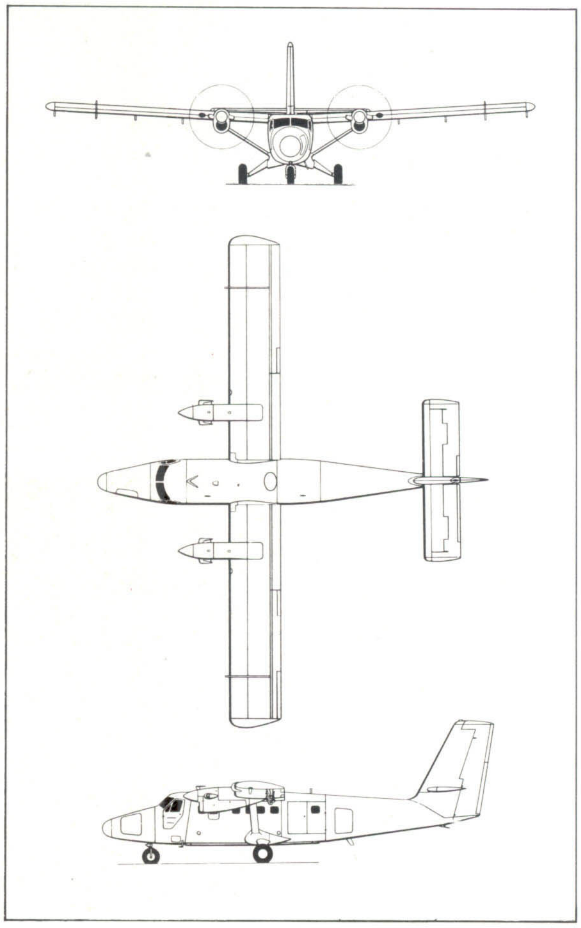
DHC-6 Twin Otter, de Havilland Canada

FIRST FLIGHT 1965

THE DHC-6 Twin Otter, constructed by the de Havilland Aircraft Company of Canada, was first announced in 1964. It is a logical progression from the company's other STOL (short take-off and landing) utility and light transport aircraft, starting with the 1947 DHC-2 Beaver and progressing with the DHC-3 Otter of 1951. De Havilland Canada's next two aircraft, the DHC-4 Caribou and DHC-5 Buffalo, are twin-engined STOL utility transports intended mainly for military users, but with the DHC-6 Twin Otter the company made a determined and highly successful attempt to capture a large portion of the twin-turboprop commuter airliner market.

Design of the Twin Otter began in January 1964, and the aircraft has many points of similarity with the Otter. The fuselage is based on that of the Otter, but lengthened and provided with new nose and tail sections. The wing is also based on that of the Otter, but is of greater span. In addition, as with other STOL types produced by de Havilland Canada, the STOL performance is achieved by a large wing of high aspect ratio, provided in the case of the Twin Otter with double-slotted wide-span trailing-edge flaps. Power is provided by a pair of Pratt & Whitney Aircraft of Canada PT6A turboprops and the Twin Otter is fitted with a fixed tricycle undercarriage for the sake of simplicity and reduced cost, despite the small penalty that must be paid in terms of drag.

Construction of the first five Twin Otters began in November 1964, and the initial aircraft took to the air on May 20, 1965 powered by two 579-ehp



DHC-6 Series 300

Type: short-range STOL light transport
Maker: de Havilland Aircraft of Canada Ltd
Span: 19.81 m (65 ft)
Length: 15.77 m (51 ft 9 in)
Height: 5.66 m (18 ft 7 in)
Wing area: 39 m² (420 sq ft)
Weight: maximum 5670 kg (12 500 lb); empty 3320 kg (7320 lb)
Powerplant: two 652-ehp Pratt & Whitney Aircraft of Canada PT6A-27 turboprops
Performance: maximum cruising speed 338 km/h (210 mph) at 3048 m (10 000 ft); range with an 1157-kg (2550-lb) payload 1278 km (794 miles)
Payload: 2005 kg (4420 lb); seats for up to 20 passengers
Crew: 1 to 2
Production: minimum 700

PT6A-6 turboprops. The next two aircraft had the same powerplant, but subsequent machines had the PT6A-20, also of 579-ehp rating.

The first production model was the Series 100, of which 115 in all were built. US Federal Aviation Administration Type Approval of the Twin Otter was secured in May 1966, and the first production aircraft was delivered to the Ontario Department of Land and Forests in July 1966.

The first Twin Otter Series 200 was delivered in April 1968, and total production of this model was also 115. The Series 200 aircraft was in nearly every respect similar to the Series 100, the one major difference being the provision of a larger nose with increased baggage stowage on the Series 200.

From the spring of 1969 the standard production model became the Series 300, fitted with 652-ehp PT6A-27 turboprops enabling maximum take-off weight to be increased by about 454 kg (1000 lb). As with the two earlier models, the Series 300 can be used on float and ski undercarriages. All float-equipped Twin Otters are fitted with the short nose characteristic of the Series 100 aircraft. Also an unusual feature of the Twin Otter is the provision for the fitting of an optional freight pack in the ventral position under the fuselage. This can carry a load up to 272 kg (600 lb) in weight.

Although the Twin Otter was designed for relatively spartan commuter services, the type's good STOL performance in 1973 persuaded the Canadian government to order six special models, designated Series 300S, to test the feasibility of STOL commuter services on an inter-city basis.

Passenger accommodation on the six Series 300S aircraft was for 11, all provided with full airline seating, and the aircraft were modified to increase their safety in operations from small paved runways in urban areas.

These improvements include the provision of upper-wing spoilers, high-capacity brakes, emergency brakes, an anti-skid braking system, improved protection in the event of an engine fire, other systems modifications, and the installation of full airline-standard avionics.

The six aircraft were used from July 24, 1974 by Airtransit Canada, a subsidiary of Air Canada, on the route between Montreal and Ottawa, fully vindicating the inter-city commuter concept for STOL aircraft.

Left: A Twin Otter of the Norwegian airline Widerøe's Flyveselskap
Below left: A Twin Otter at the Canadian National Air Show in 1973
Below: Air Wisconsin operated the DHC-6 in the mid 1960s when they were established
Bottom: A DHC-6 of Rio Airways at San Angelo, Texas, in May 1979

L-100 Hercules, Lockheed

FIRST FLIGHT 1964

THE Lockheed-Georgia company's Hercules, designed in 1951 to a US Air Force tactical airlift requirement, has enjoyed unparalleled success as a military freighter, more than 1500 having been delivered by 1979. However, preliminary attempts to market a commercial version were unsuccessful.

On April 21, 1964, however, Lockheed flew the first example of a civil Hercules, designated Model 382-44K-20 and derived from the military C-130E. This model received its US Federal Aviation Administration Type Approval on February 16, 1965, with deliveries of the initial Model 382B and L-100 aircraft beginning later in the year, notably to Alaska Airlines, Continental Air Services and Zambia Air Cargoes. These were supplemented in 1966 and 1967 by Airlift International, Delta Airlines, Interior Air Service, and Pacific Western Airlines. Not one of the following model, the L-100-10, was built: this was a proposed variant with 4500-shp Allison 501-D22A turboprops in place of the L-100's 4050-shp Allison 501-D22 engines.

The next model was thus the Model 382E, later redesignated L-100-20. Lockheed-Georgia began work on this variant in 1967, stretching the fuselage, with a view to producing a civil Hercules with better operating economics. The resulting Model 382E is some 2.54 m (8 ft 4 in) longer than its predecessor thanks to the insertion of plugs of 1.52 m (5 ft) in the forward fuselage, and of 1.02 m (3 ft 4 in) in the aft fuselage. The powerplant comprised four 4500-shp Allison 501-D22As, and though maximum weight remained unaltered at 70 308 kg (155 000 lb) the performance and capabilities of the L-100-20 were considerably improved when compared with those of the L-100.

The original Model 382 company demonstration aircraft was converted to L-100-20 standard and first flew in its new form on April 19, 1968. With FAA Type Approval being secured on October 4, 1968, the L-100-20 was soon in service, and so successful did the new type prove that many of the original L-100/Model 382B aircraft were modified to L-100-20 standard. Two basically similar Model 382Fs were produced, the powerplant being four 4050-shp Allison 501-D22s.

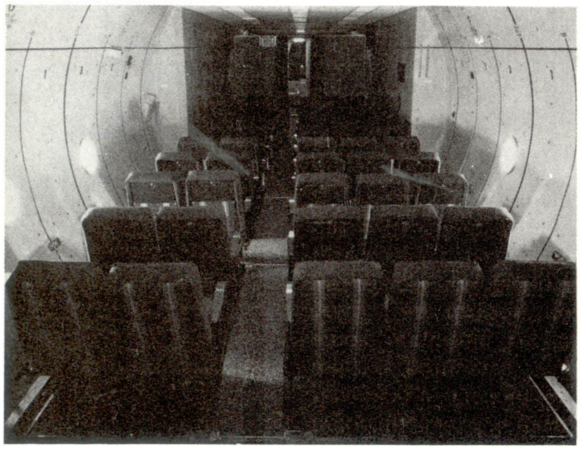
Next to appear was the Model 382G, or L-100-30, with yet another fuselage stretch, this time of 2.03 m (6 ft 8 in). The origins of this sub-type lie with Saturn Airways, which had a requirement for an aircraft to carry the entire powerplant sets for the Lockheed-California L-1011 TriStar airliner, consisting of three Rolls-Royce RB.211 turbofan engines, from England to California. Lockheed-Georgia took the opportunity presented by the development of this model to eliminate some purely military features from the aircraft, these including JATO (jet-assisted take-off – strictly speaking this should be rocket-assisted take-off) capability, paratroop doors and the rear cargo windows. The first L-100-30 flew on August 14, 1970 and with FAA Type Approval following on October 7, Saturn was able to begin operating L-100-30s in December 1970.

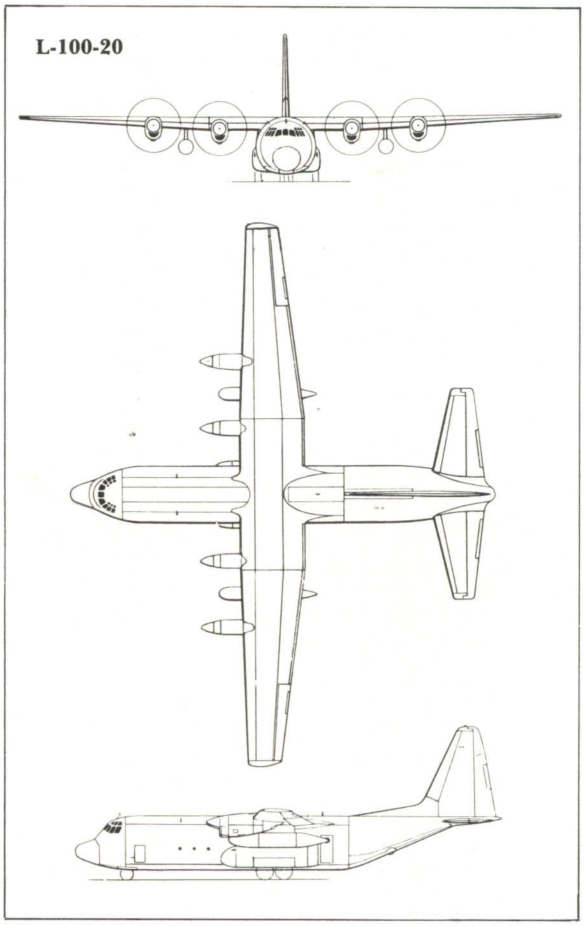
Lockheed-Georgia is currently seeking customers for its proposed L-100-50, intended as a prime freighter in the resources-support field. The key to

Right: The interior of an Indonesian L-100-30. The rear cargo windows and paratroop doors are eliminated on this model, and the seats can be removed to carry freight

the L-100-50, which the company hope to launch in 1980, is a further stretch of the fuselage. Two plugs (one forward of the wing measuring 6.1 m [20 ft] and one aft of the wing measuring 4.57 m [15 ft]) would increase length by 10.67 m (35 ft) overall. To improve the freight hold, Lockheed-Georgia propose to redesign the main undercarriage units to eliminate the L-100-30's 'bulges'.

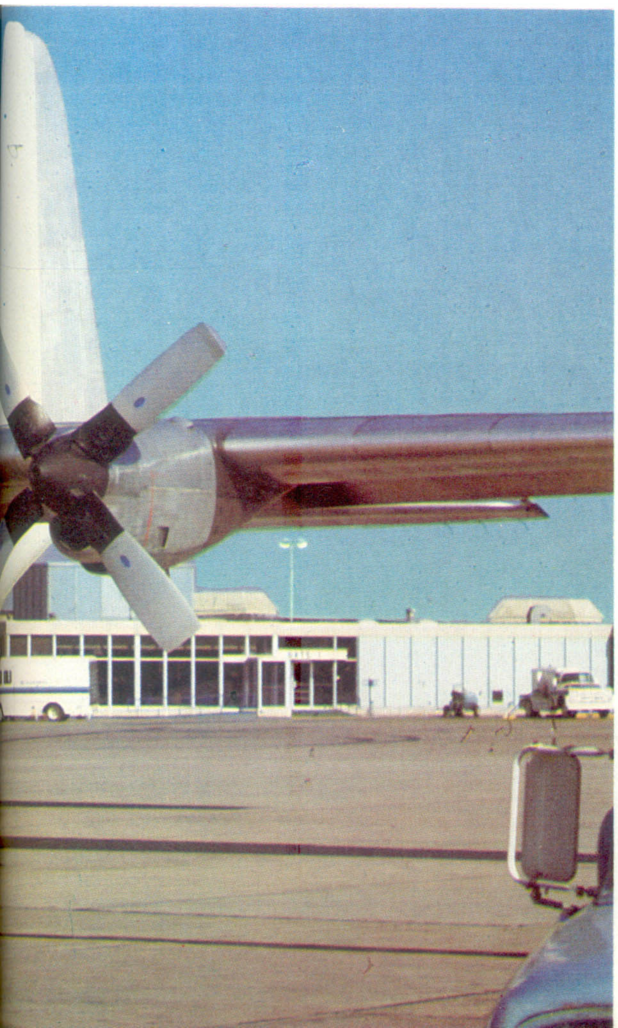
Among other L-100 proposals, Lockheed-Georgia have suggested a corporate passenger-carrier, with palletized seating and other facilities for 105 passengers, this accommodation being loaded straight through the rear doors when needed. There is also the L-400 proposal: a cut-down L-100 with a shorter wing and two 4591-shp Allison 501-D22D turboprops.





L-100-30

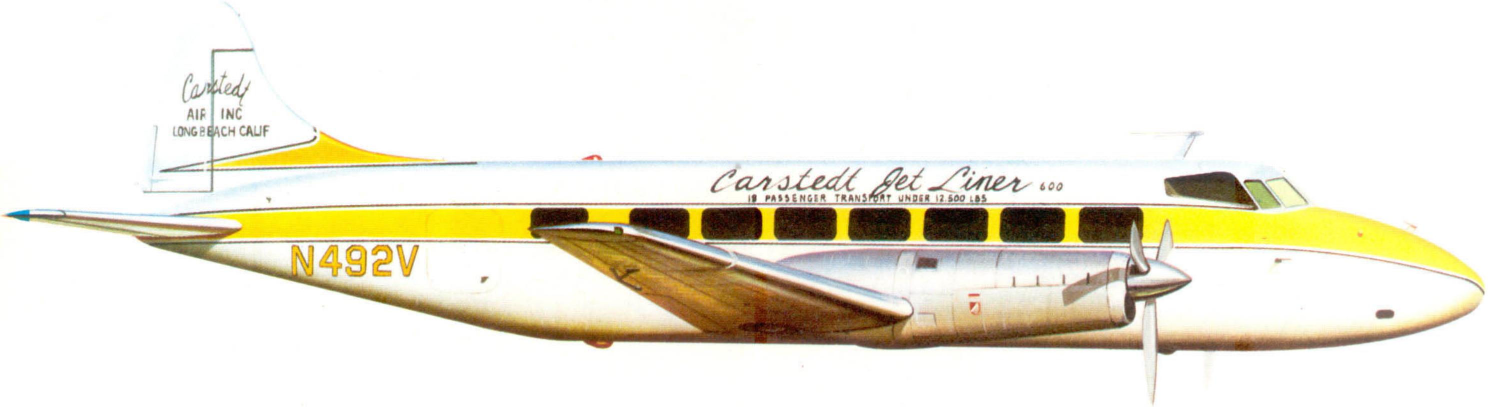
Type: medium- and long-range transport
Maker: Lockheed-Georgia Co
Span: 40.41 m (132 ft 7 in)
Length: 34.37 m (112 ft 9 in)
Height: 11.73 m (38 ft 6 in)
Wing area: 162 m^2 (1745 sq ft)
Weight: maximum 70 308 kg (155 000 lb); empty 33 563 kg (73 993 lb)
Powerplant: four 4508-ehp Allison 501-D22A turboprops
Performance: maximum cruising speed 581 km/h (361 mph) at 6096 km (20 000 ft); range with maximum payload and reserves 3363 km (2090 miles)
Payload: 23 137 kg (51 007 lb); seats for up to 105 passengers
Crew: 4 to 5
Production: 65 ordered by 1980

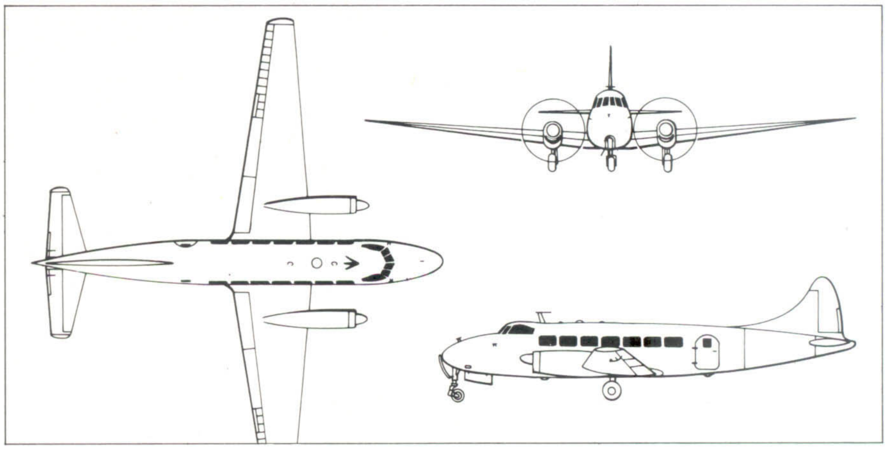


Far left: A Saturn Airways L-100-30, the first airline to operate the type in December 1970
Above: A colourful Angola Airlines L-100-30 in flight, with extended nose and slightly stretched body. The HF rail aerial along the top of the fuselage was seldom fitted to other L-100 versions
Left: The twin Hercules L-400 flying over Stone Mountain, Atlanta. Lockheed-Georgia have retained all the transport features of the standard Hercules, including the large cargo compartment

Carstedt Jet Liner

FIRST FLIGHT 1966





THE basic soundness of the concept which led de Havilland to produce its classic DH.104 Dove and DH.114 Heron light transports is attested in a number of ways, but none of these is more cogent than the variety of turboprop conversions made of the two types. Typical of Dove conversions is the Jet Liner 600 produced by Carstedt of Long Beach, California. The object of the exercise was to produce a low-cost turboprop light transport with seating for 18 passengers, and a high performance guaranteed by the installation of two relatively powerful turboprops, the chosen type being the 605-ehp Garrett-AiResearch TPE331. The type of customer whom Carstedt sought to attract is indicated by the fact that no provision was made for cabin heating, and adequate cooling was ensured by the provision of an AiResearch refrigeration system.

Intended for third-level and commuter operators, the Jet Liner 600 was first flown on December 18, 1966 and soon showed its paces and advantageous operating economics. Basic seating for 18 passengers was standard, the extra accommodation compared with the Dove coming from a plug of 2.21 m (7 ft 3 in) inserted in the rear fuselage. At the same time, improved performance was aided by lowering the height of the cockpit. This necessitated lowering the crew's seats and shifting forward the instrument panel by 20.3 cm (8 in), to give the crew adequate headroom.

The two TPE331 engines were fitted in long nacelles, and drove constant-speed, fully feathering and reversible three-blade propellers of Hartzell manufacture. To provide adequate range, the prototype Jet Liner 600 was fitted with additional fuel tankage of 850 litres (187 Imp gal) in the wings outboard of the engines. The feature was optional on production Jet Liner 600s.

A similar conversion was undertaken by Channel Airways at Southend, but the attempt was given up before much work had been done. Other American efforts towards the modernization of the Dove have not been notably successful, a typical example being the Riley Turbo Executive 400, with two 400-hp Lycoming piston engines.

Final marketing of the Jet Liner 600 was undertaken by the Texas Airplane Manufacturing Company and the aircraft had uprated engines and was designated CJ600.

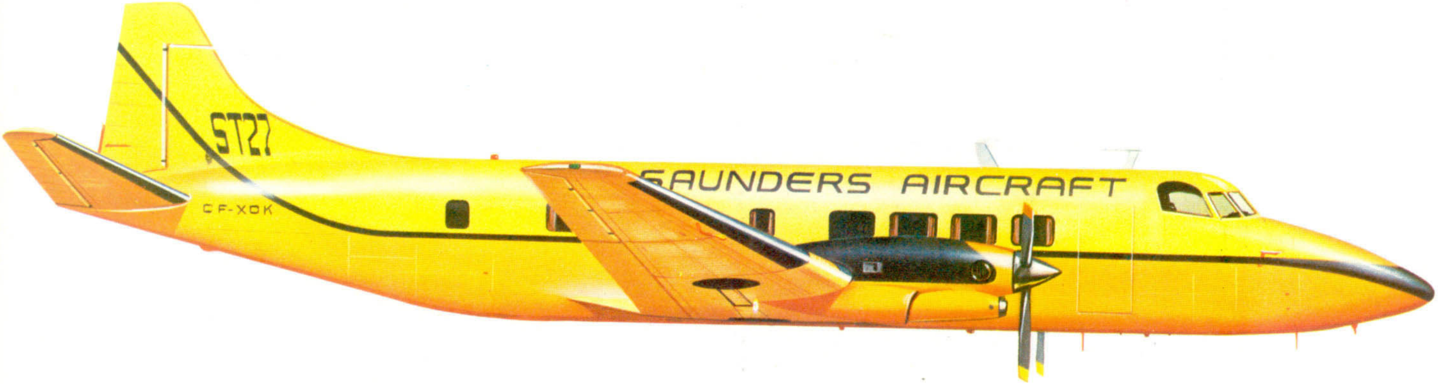
CJ600

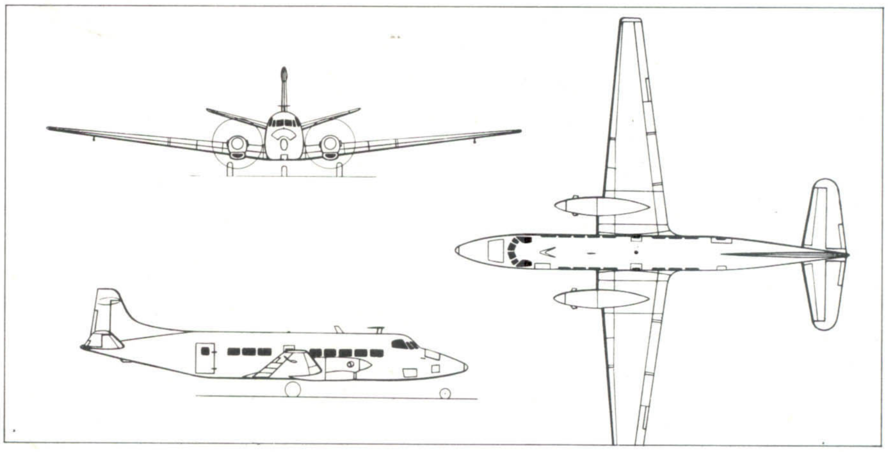
Type: light transport
Maker: Texas Airplane Manufacturing Co Inc
Span: 17.37 m (57 ft)
Length: 14.17 m (46 ft 6 in)
Height: 4.06 m (13 ft 4 in)
Wing area: 31.12 m^2 (335 sq ft)
Weight: maximum 4762 kg (10 500 lb); empty approx 2721 kg (6000 lb)
Powerplant: two 705-ehp Garrett-AiResearch TPE331-101E turboprops
Performance: maximum cruising speed 463 km/h (288 mph) at 3048 m (10 000 ft); range with maximum payload 805 km (500 miles)
Payload: seats for up to 18 passengers
Crew: 2
Production: not available

Top: The Carstedt Jet Liner in manufacturer's livery
Left: A Jet Liner at Love Field, Dallas, Texas in September 1972. The aircraft is intended for third-level commuter operators, and can carry 18 passengers

ST-27, Saunders

FIRST FLIGHT 1969





THE Saunders Aircraft Corporation was formed in 1968, with the specific intention of manufacturing turboprop conversions of the successful de Havilland DH.114 Heron. Powered by four rather than two piston engines, the Heron was designed for economical operations over short- and medium-range routes, using the most primitive of airfields. However the DH.114 Series 1 had a fixed undercarriage, whereas the definitive Series 2 had a simple retractable undercarriage.

Saunders rightly appreciated that the Heron Series 2's capabilities and field performance were admirably suited for the requirements of small operators, and that performance could be brought up to a higher level by the installation of two turboprop engines in place of the four 250-hp de Havilland Gipsy Queen 30 piston engines. The engine selected was the 715-ehp Pratt & Whitney Aircraft of Canada PT6A-27, and the first such conversion flew on May 18, 1969. Apart from a measure of structural strengthening and modification associated with the new powerplant, the most notable difference between the Heron and the ST-27, as the new type was designated, was the lengthening of the fuselage from 14.78 m (48 ft 6 in) to 17.93 m (58 ft 10 in) to increase seating from 17 to 23. In all, 13 ST-27 conversions were produced before a shortage of Herons suitable for conversion led Saunders to explore a new type design.

This was the ST-27B, pioneered in fact by the thirteenth ST-27 under the designation ST-27A. This aircraft first flew on July 18, 1974 and its success fully vindicated the concept of building the new aircraft from scratch, which also allowed the structure and systems to be revised to meet updated requirements. At the same time the vertical tail surfaces were redesigned, the interior modified, more powerful engines fitted, and fuel tankage increased. The ST-27B was redesignated ST-28 on February 1, 1975, and some seven of the type had been ordered by the end of the month.

Saunders initiated the production of a first batch of 15 ST-28s, but early in 1976 the company was forced into liquidation by the withdrawal of financial support by the provincial government of Manitoba, just after the sole ST-28 had taken to the air on December 12, 1974. At the time of this flight, the company had secured orders for 34 ST-28s, which indicated that it had a useful future.

ST-27

Type: short-range light transport
Maker: Saunders Aircraft Corporation Ltd
Span: 21.79 m (71 ft 6 in)
Length: 17.98 m (59 ft)
Height: 4.75 m (15 ft 7 in)
Wing area: 46.36 m^2 (499 sq ft)
Weight: maximum 6124 kg (13 500 lb); empty 3175 kg (7000 lb)
Powerplant: two 715-ehp United Aircraft of Canada PT6A-27 turboprops
Performance: maximum cruising speed 370 km/h (230 mph); maximum range 1315 km (817 miles)
Payload: 435 kg (960 lb) baggage; seats for up to 23 passengers
Crew: 2
Production: 13

Top: An ST-27 in Saunders Aircraft Corporation colours
Left: The ST-27 was judged ideal for firms like Tropic Air which operates an inter-island service in Barbados

Metro, Swearingen

FIRST FLIGHT 1970

THE Metro pressurized third-level airliner was designed by E J Swearingen before the absorption of his company, Swearingen Aviation Corporation, by Fairchild Industries in 1971.

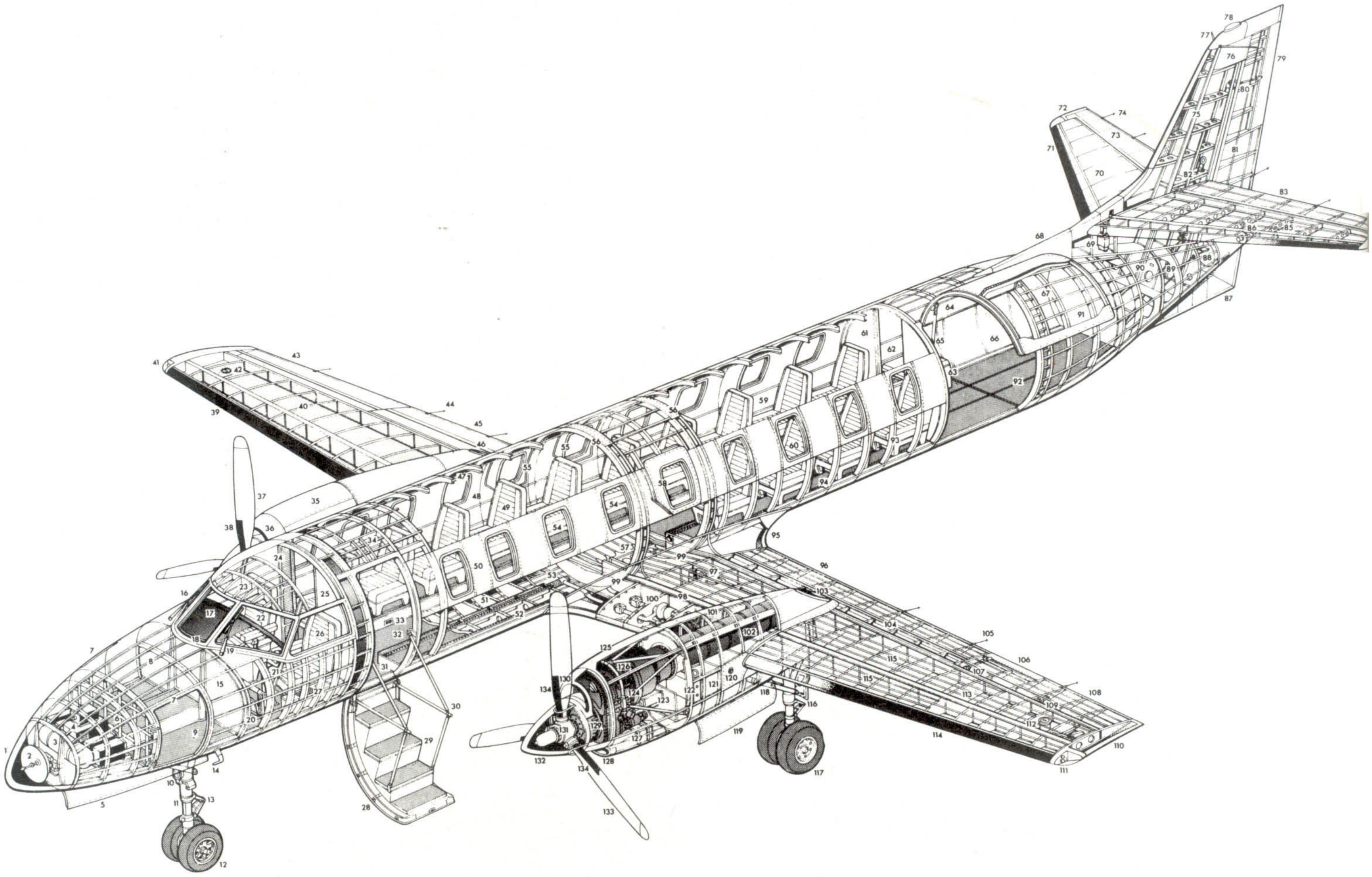
Planned for third-level commuter airlines, the Metro has basic seating for 20 in single seats on each side of the central aisle, and all the comforts of a full-size airliner. With considerable foresight and ingenuity, however, Swearingen also made the basic design capable of accepting alternative interiors suiting the aircraft to executive use, as a flying ambulance, as a flying hospital, as a photographic-survey aircraft, and as a cargo aircraft.

The Metro first flew on June 11, 1970, and after receiving its US Federal Aviation Administration Type Approval, entered service in the first part of 1971. The type found ready acceptance, and the order book grew satisfactorily. Matters were further improved in 1974 with the introduction of the Metro II. This introduced a number of improvements to the flight deck and aircraft systems, larger windows, and provision for a JATO (jet-assisted take-off) unit. This last is most unusual in civil aircraft, and consists of an optional 159-kg (350-lb) st rocket in the tail to improve the Metro II's performance in 'hot and high' conditions. For the same purpose there is also provision for water/alcohol injection to the Garrett-AiResearch turboprops.

Separated from the passenger cabin by an optional bulkhead is a freight compartment. This is pressurized, and has a volume of 3.85 m^3 (136 cu ft). Loading is effected through a large door in the left side of the rear fuselage. The Metro is also offered in an all-freight configuration without windows. The elimination of passenger seating and facilities allows the payload to be increased slightly, from 1778 kg (3920 lb) to 2064 kg (4550 lb). Baggage is carried, in the passenger version, in an unpressurized compartment in the nose, and this has a volume of 1.27 m^3 (45 cu ft).

The main variant of the Metro is the Merlin IV, the Merlin IVA being similarly derived from the Metro II. These aircraft have no link with earlier Merlin models, except for the fact that they are intended as executive transports. The Merlin IV and IVA are at first glance externally similar to their 'parent' aircraft, with the exception of a reduced number of fuselage windows reflecting

Above: A Swearingen Metro, a popular commuter aircraft in the USA, taxies off the main landing strip of a US domestic airport



Left: A Metro of Air Wisconsin Inc at Purdue University Airport. Air Wisconsin operates 13 Metros and connects with towns around Chicago and Minneapolis/St Paul

the smaller passenger capacity of the Merlins.

Designed as comfortable transports for corporate officers, the Merlin IV and IVA have seating for 12 to 15 passengers, together with a lavatory and increased baggage stowage. This latter has a volume of 4.05 m^3 (143 cu ft). Another difference is that the fuel capacity of the Merlin IV and IVA is reduced from the 2452 litres (539 Imp gal) of the Metro II to 2096 litres (461 Imp gal). The Merlin IVA cruises at a speed some 26 km/h (16 mph) faster than that of the Metro II, and also at an altitude of 4877 m (16 000 ft) rather than 3048 m (10 000 ft). The reduction in fuel capacity is reflected in the Merlin IVA's ferry range of 3371 km (2095 miles) compared with the Metro II's 3952 km (2456 miles).

The pressurization and full airline-standard instrumentation of the Metro II prepares the aircraft well for its other intended missions. In the air ambulance role the aircraft can carry up to 10 litter patients, while in the flying hospital role the aircraft can be fitted out as an emergency operating theatre. For aerial survey work the Metro II can accommodate one or two cameras.

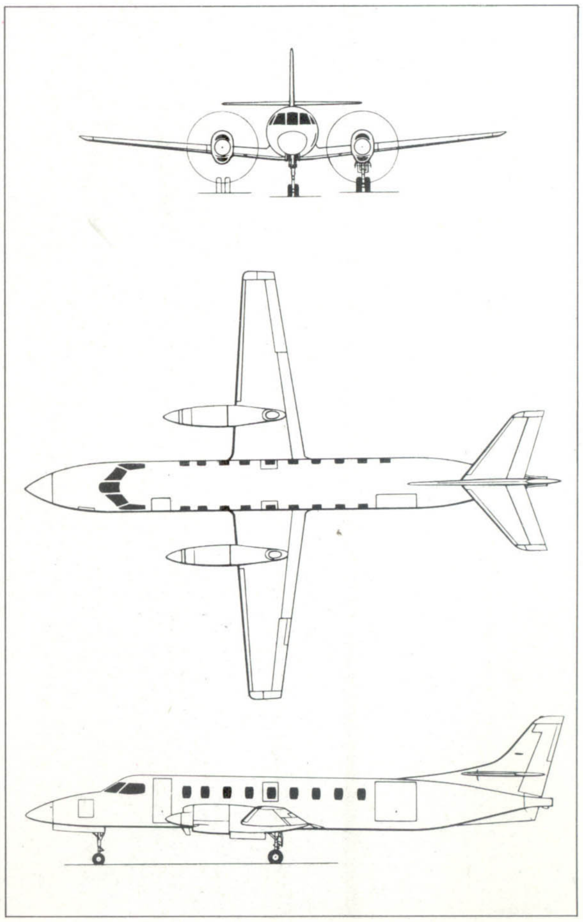
It is the type's ease of conversion to these other roles which has made it popular with the armed forces of smaller countries such as the Royal Oman Police Air Wing, which has two, and the Chilean Police Department, which has four. Other major users are Air Wisconsin and Southern Airways, the former with 12 aircraft and the latter with eight. By 1980 Metros were in worldwide use.

SA-226TC Metro II

Type: short-range transport
Maker: Swearingen Aviation Corporation, Fairchild Industries
Span: 14.1 m (46 ft 3 in)
Length: 18.1 m (59 ft 4¾ in)
Height: 5.12 m (16 ft 9¾ in)
Wing area: 25.78 m^2 (278 sq ft)
Weight: maximum 5670 kg (12 500 lb); empty 3379 kg (7450 lb)
Powerplant: two 940-shp Garrett-AiResearch TPE331-3UW-303G turboprops
Performance: maximum cruising speed 473 km/h (294 mph) at 3048 m (10 000 ft); range with maximum payload and reserves 346 km (215 miles)
Payload: 1778 kg (3920 lb); seats for up to 20 passengers
Crew: 2
Production: minimum 86 by January 1979

Swearingen Metro II

1 Radome
2 Weather radar scanner
3 Oxygen bottle
4 Radio and electronics equipment
5 Nosewheel door
6 Baggage restraint net
7 Baggage doors, forward opening
8 Fuselage nose construction
9 Nose baggage hold
10 Landing and taxi lamp
11 Nosewheel leg
12 Twin nosewheels
13 Torque scissors
14 Pitot tube
15 Cockpit pressure bulkhead
16 Windscreen panels
17 Instrument panel shroud
18 Curved centre panel
19 Windscreen wipers
20 Rudder pedals
21 Control column
22 Co-pilot's seat
23 Cockpit roof construction
24 Cockpit bulkhead
25 Electrical panels
26 Pilot's seat
27 Pilot's side control panel
28 Passenger door
29 Airstairs
30 Handrails
31 Entry doorway
32 Cabin centre aisle floor
33 Air conditioning duct louvre
34 Forward fuselage frame construction
35 Right engine cowlings
36 Engine intake
37 Hartzell three-blade constant-speed reversing and feathering propeller
38 Propeller de-icing boot
39 Leading edge de-icing
40 Right wing fuel tank
41 Right navigation light
42 Fuel filler tank
43 Right aileron
44 Static dischargers
45 Right flap
46 Tailpipe exhaust duct
47 Fuselage frames
48 Cabin interior trim panels
49 Passenger seats
50 Window side panel
51 Cabin floor construction
52 Seat rails
53 Air trunking
54 Cabin windows
55 Right emergency escape hatches
56 Main fuselage frames
57 Centre box construction
58 Left emergency escape hatch
59 Right seating, ten passengers
60 Left seating, nine passengers
61 Cabin rear bulkhead
62 Toilet compartment door
63 Toilet
64 Rear cargo door
65 Door actuator
66 Rear cargo and baggage compartment
67 Fuselage frame and stringer compartment
68 Fin root fillet
69 Tailplane electric trim jacks
70 Right tailplane
71 Leading edge de-icing
72 Elevator horn balance
73 Right elevator
74 Static dischargers
75 Fin construction
76 Rudder balance
77 Antenna
78 Anti-collision light
79 Rudder trim tab
80 Trim tab control jack
81 Rudder construction
82 Elevator hinge control
83 Left elevator
84 Static dischargers
85 Tailplane construction
86 Tail navigation light
87 Ventral fin
88 Rudder hinge control
89 Tailplane control cables
90 Fin attachment frame
91 Cargo hold rear bulkhead
92 Baggage/cargo hold floor
93 Rear fuselage frames
94 Seat fixing rails
95 Trailing edge root fillet
96 Left flap
97 Fuel pumps
98 Wing main spar
99 Wing spar attachment
100 Air conditioning plant
101 Engine cowling construction
102 Tailpipe
103 Engine exhaust duct
104 Double slotted flap construction
105 Static dischargers
106 Aileron trim tab
107 Trim tab hinge control
108 Left aileron
109 Aileron hinge control
110 Left wing-tip
111 Left navigation light
112 Fuel tank filler cap
113 Wing rib construction
114 Leading edge de-icing
115 Left wing fuel tank
116 Main undercarriage leg
117 Twin mainwheels
118 Retractable strut
119 Mainwheel door
120 Leading edge ice inspection light
121 Main undercarriage wheel bay
122 Hydraulic system reservoir
123 Engine oil tank
124 Engine bearers
125 Detachable engine cowlings
126 Garrett AiResearch TPE 331-3UW-303G turboprop
127 Oil cooler
128 Oil-cooler intake
129 Propeller gearbox
130 Engine intake
131 Propeller reversing and feathering hub mechanism
132 Spinner
133 Hartzell three-blade propeller
134 Propeller blade de-icing boots



Shorts 330

FIRST FLIGHT 1974

THE Shorts 330 is essentially a refined and enlarged version of the Skyvan utility transport, intended mainly for third-level and commuter operators requiring a slightly larger and higher-powered aircraft to replace the first-generation of such aircraft. Developed as the SD3-30, the 330 uses outer-wing panels based on those of the Skyvan, and a fuselage with the same rectangular section as that of the Skyvan, but lengthened by some 3.78 m (12 ft 5 in).

The basic accommodation is for 30 passengers seated three-abreast (2+1) with an offset aisle. The seats are mounted on rails, however, for the easy conversion of the type to other seating configurations. Maximum use is made of the rectangular-section of the fuselage for the carriage of baggage and freight.

The 330 can also be used for mixed freight/passenger operations, with a bulkhead separating the rear passenger cabin for about 18 people from the forward freight compartment.

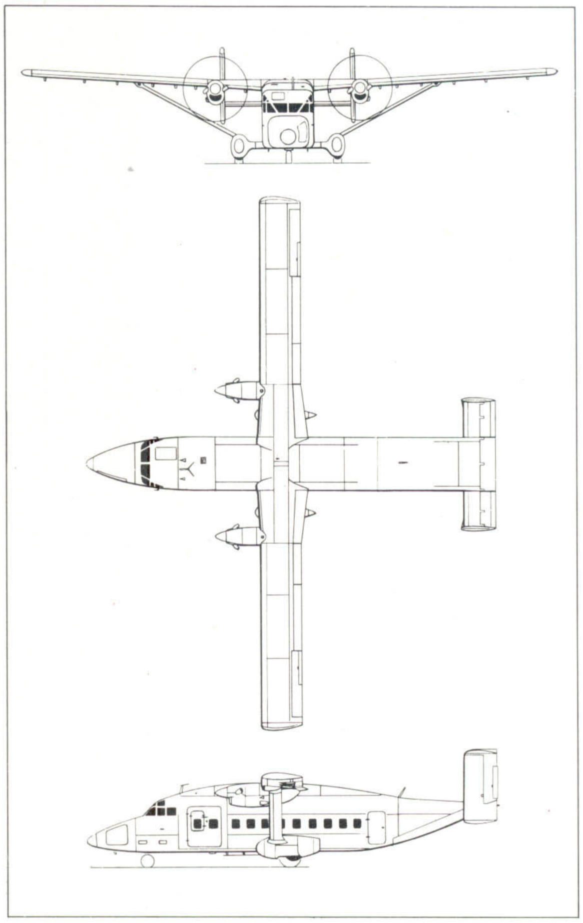
The mainwheel units retract neatly into sponsons projecting from the fuselage sides and forming the lower attachment points for the wing bracing struts. The wheels are carried on short pivoted levers rather than legs, and this keeps the fuselage of the 330 close to the ground, thus facilitating loading and unloading.

A natural evolution from the dumpier Skyvan, the 330 was an immediately attractive prospect. One of the major design objectives was to produce quickly an aircraft with a selling price of less than US $1 million, and this was made feasible by the use of Skyvan components.

The first prototype, powered by Pratt & Whitney Aircraft of Canada PT6A-45 turboprops, flew on August 22, 1974, with the second prototype following on July 8, 1975. American orders for the 330 had started to come in some eight days before the first prototype flew.

The first production aircraft flew on December 15, 1975 and was delivered to Time Air of Canada. Time Air flew the first 330 service on August 24, 1976.

Since then the growth of orders has been satisfactory, and should eventually reach 300. Shorts have also planned the military SD3-M version seating 32 troops and a multi-sensor maritime patrol variant, the SD3-MR Seeker which looks superior to most of its competitors.

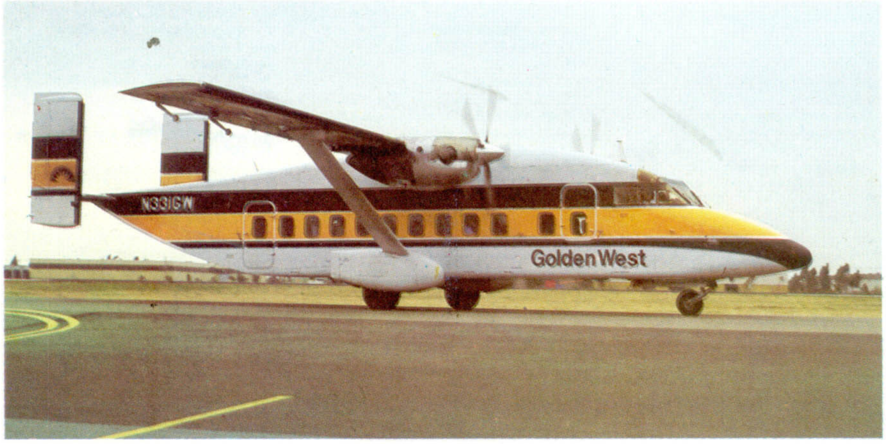


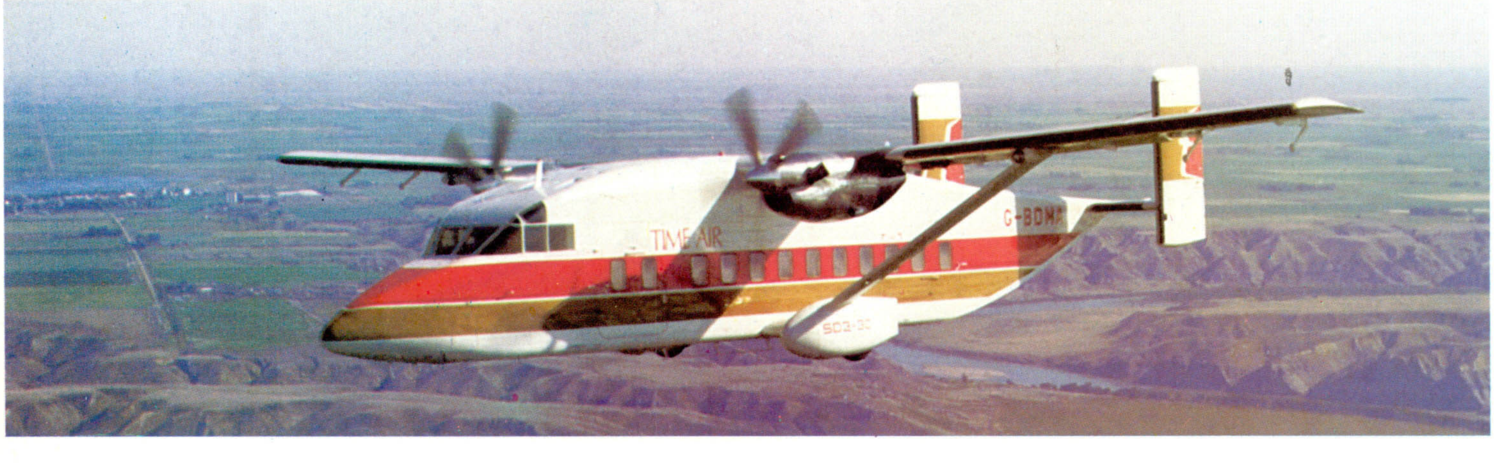
Shorts 330

Type: short- and medium-range transport
Maker: Short Brothers Ltd
Span: 22.76 m (74 ft 8 in)
Length: 17.69 m (58 ft 0½ in)
Height: 4.95 m (16 ft 3 in)
Wing area: 42.1 m^2 (453 sq ft)
Weight: maximum 10 161 kg (22 400 lb); empty 6536 kg (14 410 lb)
Powerplant: two 1156-shp Pratt & Whitney Aircraft of Canada PT6A-45A turboprops
Performance: maximum cruising speed 365 km/h (227 mph) at 3048 m (10 000 ft); range with maximum payload 804 km (506 miles)
Payload: 3402 kg (7500 lb); seats for up to 30 passengers
Crew: 3
Production: 58 orders by March 1980

Below: N-331GW Shorts 330 (formerly G-BEWT), of Golden West Airlines at Orange County Airport, California

Bottom: A Shorts 330 of Time Air, a Canadian internal airline operating from Lethbridge, Alberta





Jetstream, British Aerospace

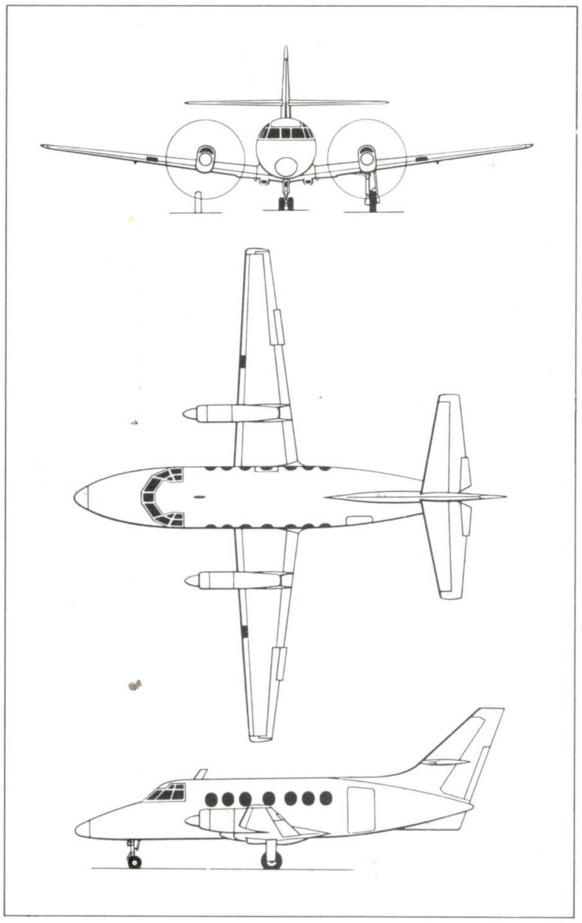
FIRST FLIGHT 1967

THE design of the BAe Jetstream started life as the Handley Page HP.137, was taken over by Jetstream Aircraft on the failure of Handley Page, was then bought by Scottish Aviation, and is now the responsibility of the British Aerospace Aircraft Group, Scottish Division.

The decision was made in August 1965 to develop the type for initial single-pilot operation with a maximum take-off weight of up to 5670 kg (12 500 lb), full pressurization, 1.83-m (6-ft) cabin height, a long fatigue life, and provision for the type to be used as a 20-seat commuter aircraft or as an eight-seat executive aircraft.

Considerable interest in the project was immediately shown in the United States, Riley Aeronautics Corporation ordering 20 Jetstreams 'off the drawing board' – even before the decision was made in January 1966 to press ahead with the construction of four prototypes with company funding. Soon after this, the government also decided to invest in the project in the form of a loan. Continued American interest is attested by the conversion of Riley Aeronautics into the Riley Jetstream Corporation, and its subsequent takeover by the International Jetstream Corporation, which had by September 1965 received 65 orders for the as yet unflown aircraft.

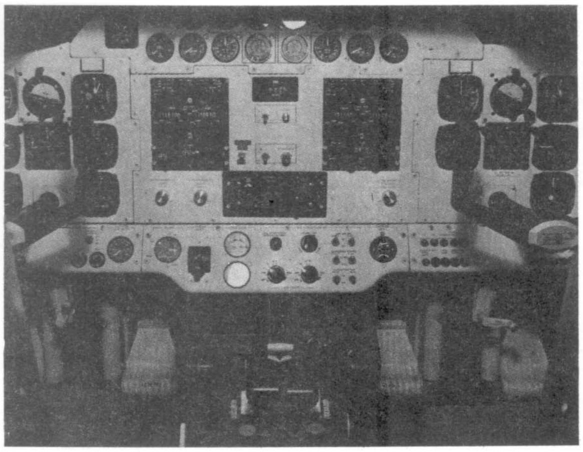
The key to the Jetstream's design was an extreme refinement of conventional design, based on a well streamlined fuselage of considerable diameter, straight wings and tailplane, and a swept fin and rudder. One of the main reasons for the selection of the Turboméca Astazou XIV as the

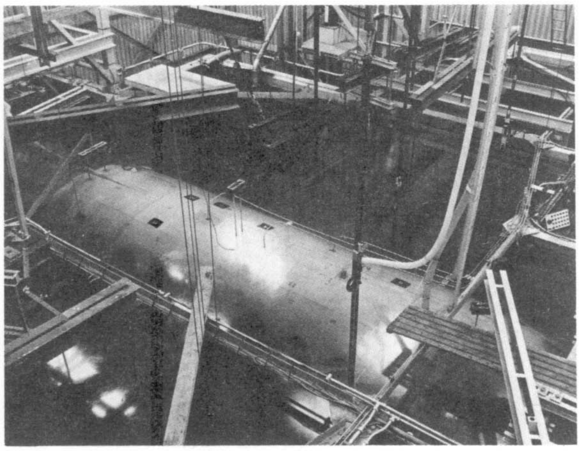


Jetstream Series 200

Type: short- and medium-range light transport
Maker: British Aerospace Aircraft Group, Scottish Division
Span: 15.85 m (52 ft)
Length: 14.37 m (47 ft 1½ in)
Height: 5.32 m (17 ft 5½ in)
Wing area: 25.08 m^2 (270 sq ft)
Weight: maximum 5700 kg (12 566 lb); empty 3485 kg (7683 lb)
Powerplant: two 996-ehp Turboméca Astazou XVIC2 turboprops
Performance: maximum cruising speed 454 km/h (282 mph) at 3048 m (10 000 ft); range with reserves 2244 km (1380 miles)
Payload: 1730 kg (3814 lb); seats for up to 16 passengers
Crew: 2
Production: 36

Below: A Handley Page Jetstream of Apollo Airways, which provides a commuter link for towns in California





Far left: A typical instrument and control layout for the Jetstream Series 200
Left: A Jetstream under water in a fatigue test tank at Prestwick in Ayrshire, Scotland
Below: Jetstream production at Prestwick
Right: The Jetstream in service with Cal-State Air Lines

basic powerplant was its small diameter, which confirmed with Handley Page's strenuous efforts to reduce drag to a minimum.

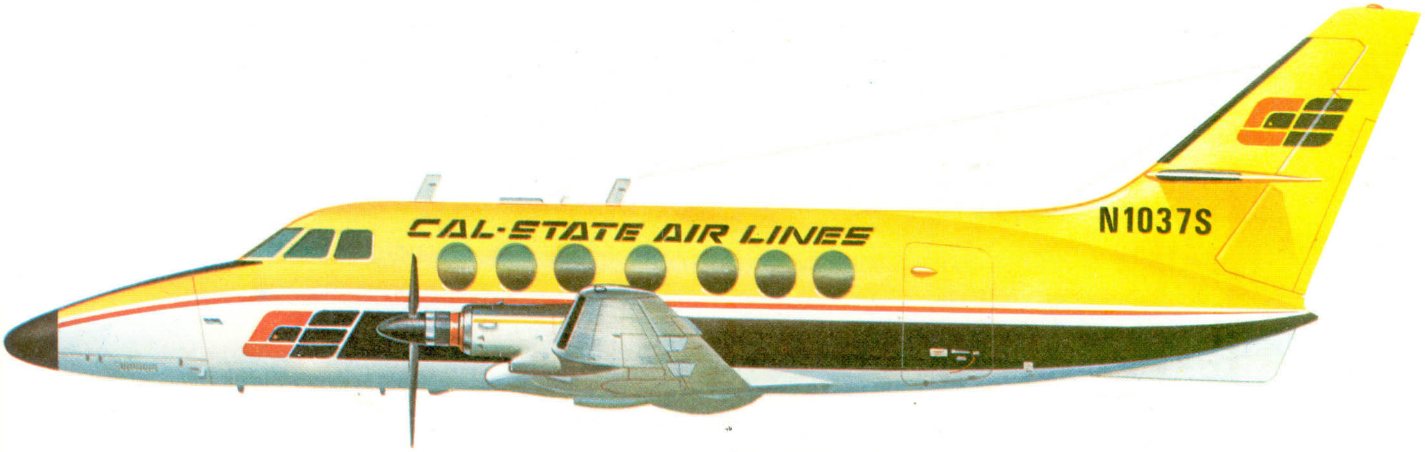
The first prototype flew on August 18, 1967, by which time production of the Jetstream Mk 1 had already started. Although the remaining three prototypes first called for were also engined with Astazou turboprops, the American preference for their own engines was reflected in the provision of Garrett-AiResearch TPE331 turboprops on a fifth prototype.

The TPE331s were largely the result of strong interest in the type shown by the US military. Although the Beechcraft 99 had at first been selected as the US Air Force's new 'mission support' transport, the Secretary of Defense overruled the USAF and called for an initial batch of 11 Jetstreams for trials under the company designation Jetstream 3M. In October 1969 the USAF cancelled their order on the grounds of late delivery, thus placing the whole Jetstream Mk 3 programme for military and civilian users in jeopardy.

Meanwhile the first production Jetstream Mk 1 had flown on December 6, 1968, and was soon ferried to the United States, where Federal Aviation Administration Type Approval was secured in April 1969. Demand for the new aircraft was brisk in the United States, but Handley Page's severe financial problems were badly hampering production, and only 38 aircraft had been delivered by the time of the company's collapse in 1970. Another ten Jetstreams were subsequently built from components already produced, five by Jetstream Aircraft and five by Scottish Aviation.

Scottish Aviation also took up development of the Astazou XVI-powered Jetstream Mk 2 (Series 200), 26 of which were produced for the Royal Air Force as Jetstream T.1, some of them subsequently becoming Royal Navy T.2s.

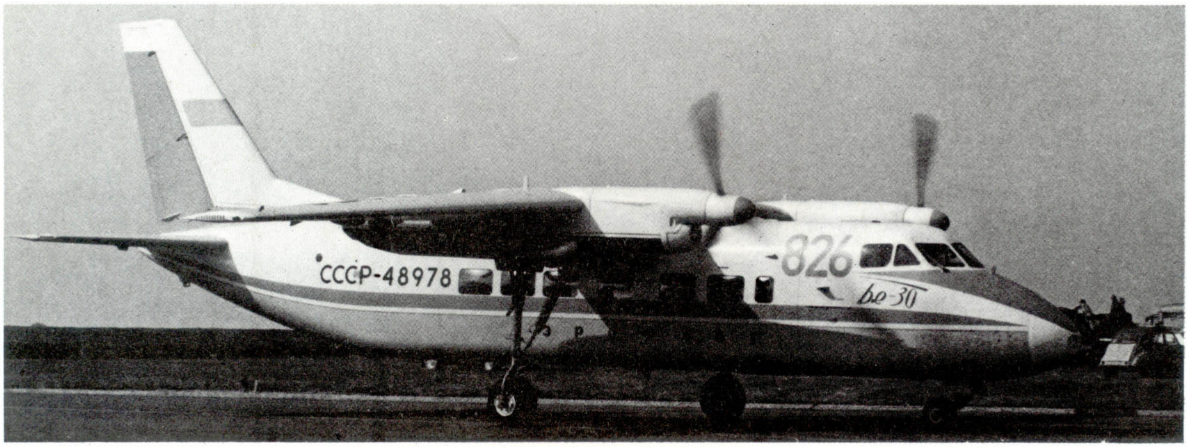
Current hopes for a renaissance of the Jetstream in production rest with the Mk 31, proposed by the Scottish Division during 1978 with a pair of Garrett-AiResearch TPE331-10 turboprops flat-rated to 840 shp each. The Astazous have been unpopular in the United States (one Jetstream has been re-engined with PT6A-34s by Riley, while Century Aircraft and Volpar have produced the Century Jetstream III with TPE331-3U-303s), so the proposal clearly has merit for this otherwise first-rate aircraft.


CAL-STATE AIR LINES
N1037S

54
50

Be-30, Beriev

FIRST FLIGHT 1967

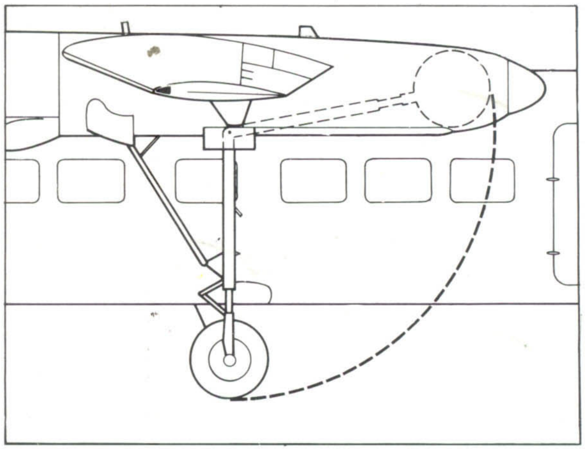


Above, left and right: A Be-30 during a visit to the West. Though the aircraft is in Aeroflot markings, it was not adopted for service with the Soviet national airline. Aeroflot had issued a specification for a short-haul local-service machine, but after evaluation of the Be-30 in the late 1960s, they made the interesting choice of the Czechoslovakian Let 410
Below left: The Be-30 had a wide undercarriage which gave good stability for landing on rough airstrips. However, due to the high wing configuration the main gear was housed in pods aft of the engines

THE Beriev Be-30 feederliner has the distinction of being the only landplane known to have been produced by the Beriev design bureau, which has since 1932 concentrated on the development of flying boats. Design of the Be-30 began in 1965 in response to an Aeroflot requirement for a replacement for the Antonov An-2, Ilyushin Il-14 and Lisunov Li-2 as a feederliner able to operate from the most primitive airfields over routes up to 300 km (186 miles) in length. The primitive-field requirement is clearly recognized in the Be-30's adoption of a high-wing layout to keep the engines and propellers clear of runway debris, though this entailed the provision of main undercarriage legs of considerable 'stalkiness'.

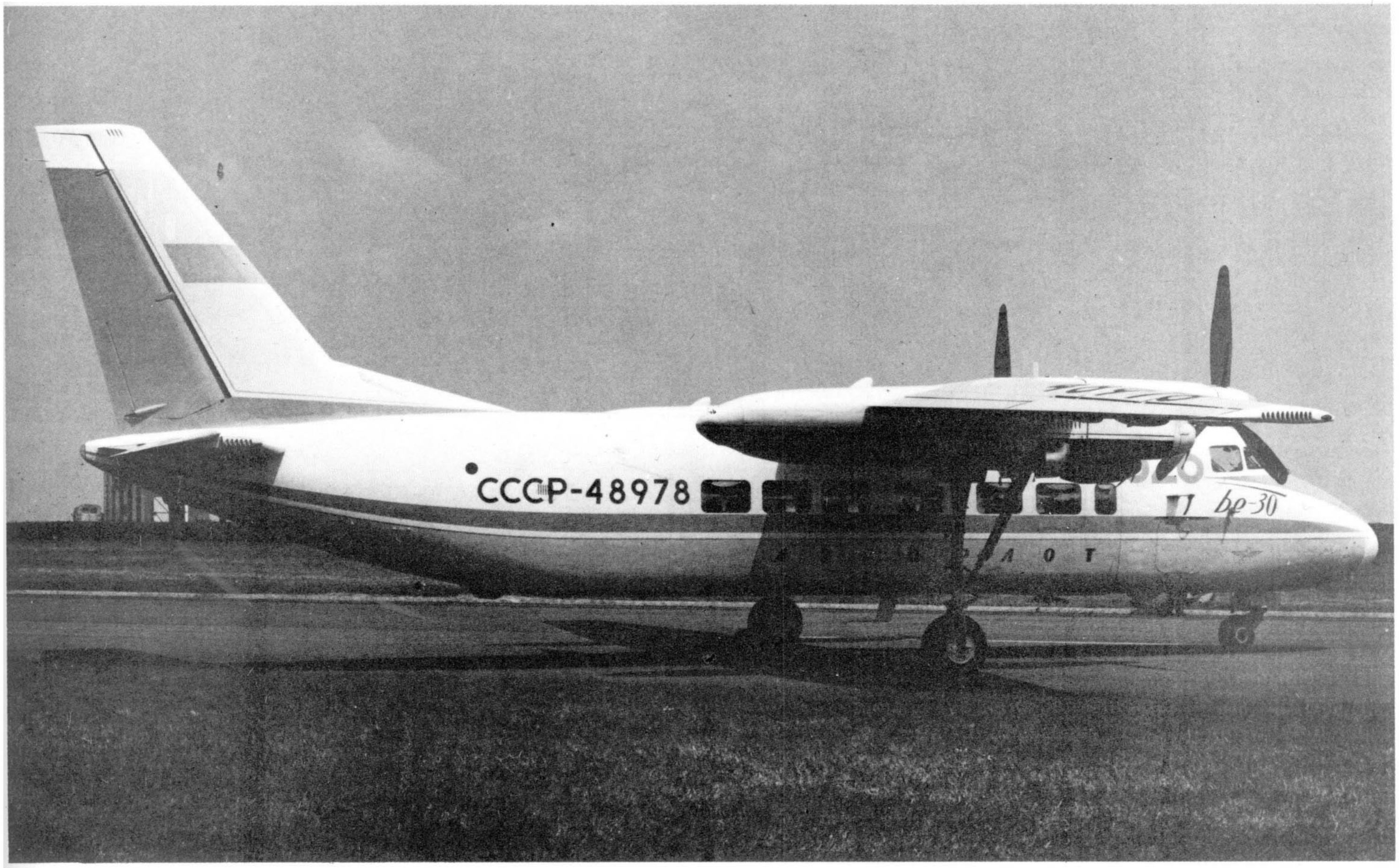
The first Be-30 prototype flew on March 3, 1967 on the power of a pair of 740-hp Shvetsov ASh-21 radial piston engines. It seems that at this stage the Russians were contemplating the installation on production Be-30s of 922-shp Turboméca Astazou XIV turboprops. This scheme came to nothing, however, and while an experimental installation of a pair of turboprops appears to have been made in 1967, the Russians maintain that a turboprop-powered Be-30 did not take to the air until July 14, 1968.

The powerplant in this instance was a pair of 950-ehp Glushenkov TVD-10 turboprops in slim nacelles projecting to the rear of the trailing edge to provide a housing for the long legs of the rearward-retracting main undercarriage legs. To facilitate operations from rough fields, the tyres fitted were of the low-pressure type.



An unusual feature of this STOL (short take-off and landing) type was the mechanical linkage of the two engines by means of a drive shaft through the wings. This provided for both propellers to be driven from one engine in the event of the other engine failing. Such a feature was thought desirable for the type of operations to be undertaken by the Be-30, extra low-speed handling and lift capacity being provided by the double-slotted ailerons and flaps.

Intended for limited services only, the Be-30 was designed for single-crew operation. This meant that an extra passenger could sit in the cockpit alongside the pilot, raising passenger capacity in the standard layout to 15. The other 14 passengers sat in the unpressurized main cabin in single seats

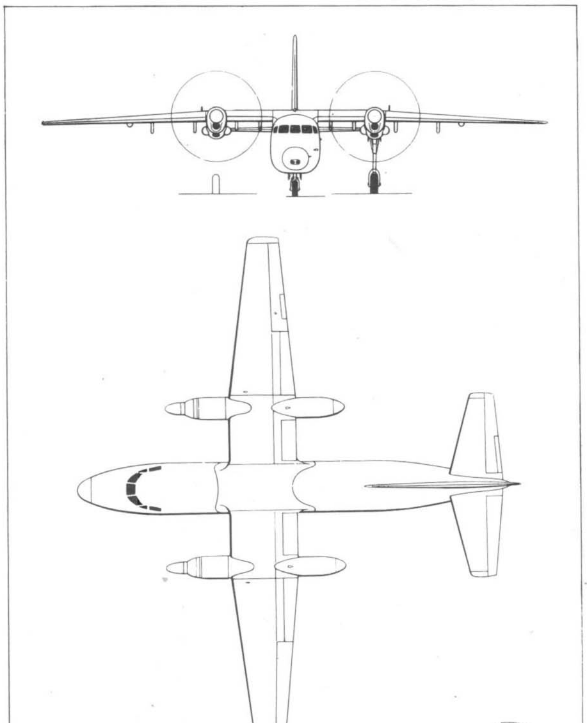


located on each side of the central aisle. To the rear of the passenger cabin were the lavatory and baggage compartment, the latter having a volume of 1.6 m^3 (57 cu ft).

An additional quantity of baggage can be stowed in a compartment between the cockpit and passenger cabin. The payload of the Be-30 was supplemented by a main compartment in the nose of the aircraft. Entry and exit from the aircraft were effected by means of an inbuilt folding airstair. The Be-30 was also to have been offered in a high-density configuration with seating for 20 passengers in the main cabin at the expense of baggage.

Figures released by Aviaexport, the Russian aircraft export agency, revealed the Be-30 as having impressively low operating costs over a stage length of 600 km (373 miles) with a payload of 1285 kg (2833 lb), but the type was not seen in the West after its appearance at the Paris air show of 1969. Any further mention of the aircraft in the Russian media ended in 1971. It is now clear, however, that despite earlier assessments that the Be-30 had been abandoned because of development problems, the real reason for the type's failure to enter production is different.

The Be-30 was evaluated against a Czech competitor, the Let L-410 Turbolet, and rejected in favour of the Czech aircraft. This led to the termination of the Be-30 programme, which had also envisaged other versions of the aircraft: as an executive aircraft, an aerial survey aircraft and an ambulance aircraft with accommodation for nine litters, six sitting casualties and an attendant.

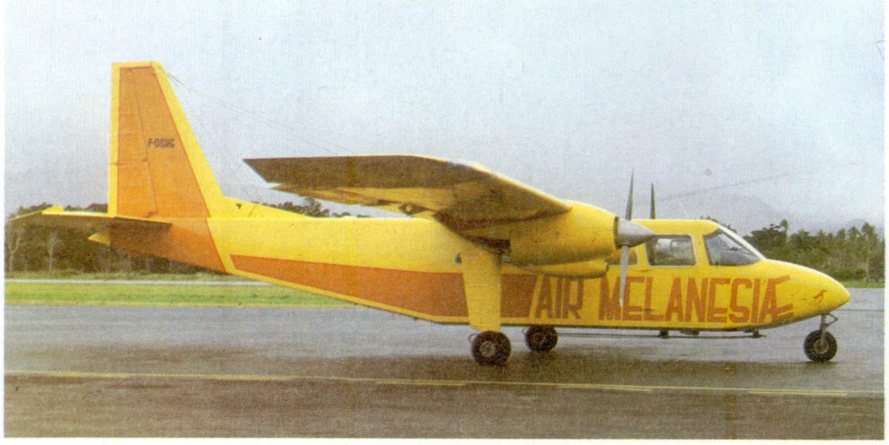


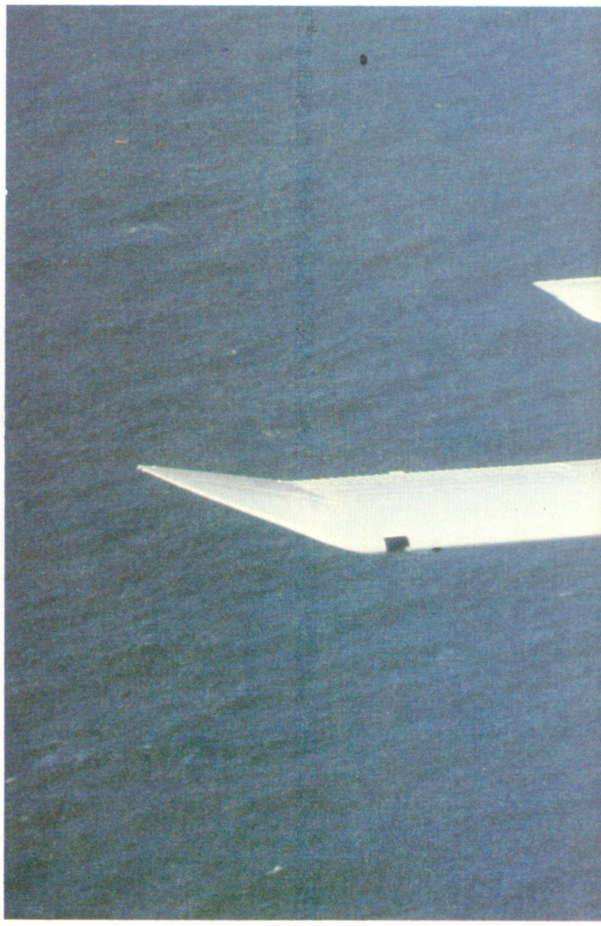
Be-30

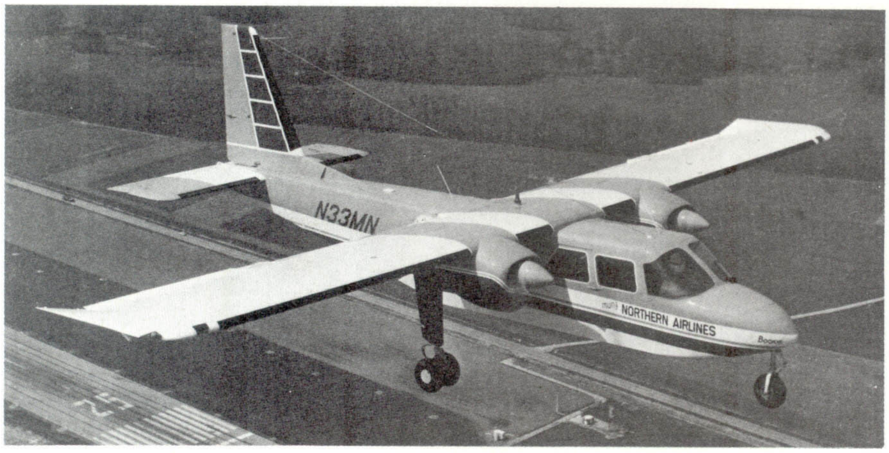
Type: short- and medium-range STOL transport
Maker: Beriev Design Bureau
Span: 17 m (55 ft 9½ in)
Length: 15.7 m (51 ft 6 in)
Height: not available
Wing area: 32 m^2 (344½ sq ft)
Weight: maximum 5860 kg (12 919 lb); empty not available
Powerplant: two 950-ehp Glushenkov TVD-10 turboprops
Performance: cruising speed up to 480 km/h (298 mph); range with 1250-kg (2756-lb) payload and reserves 600 km (373 miles)
Payload: 1500 kg (3307 lb); seats for up to 15 passengers
Crew: 1
Production: not available

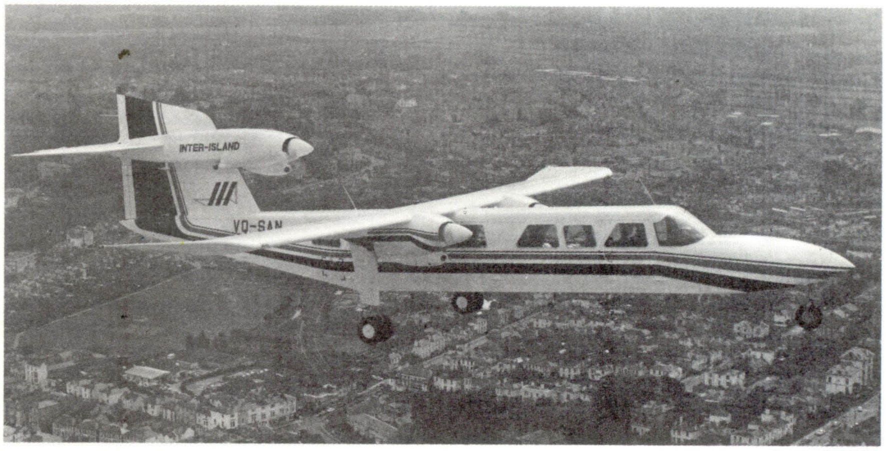
Turbo-Islander, Britten-Norman

FIRST FLIGHT 1977









THE Britten-Norman Turbo-Islander, essentially a turboprop-powered derivative of the best-selling Islander utility transport and feederliner, was announced by the manufacturer on October 29, 1975. The substitution of two 400-shp turboprops for the Islander's 260- or 300-hp Lycoming piston engines can be achieved with minimal structural alteration, which increases performance and payload without a commensurate increase in specific fuel consumption.

Design of the Turbo-Islander began in August 1975, the engine envisaged being the 600-shp Avco Lycoming LTP101, flat-rated to 400 shp. To cater for the increased power of this unit the wings have been strengthened structurally, as has the fuselage. The maximum take-off weight of the Turbo-Islander being 318 kg (700 lb) greater than that of the standard Islander, the undercarriage has also been beefed up. The fuselage is basically that of the Islander provided with the optional nose extension of 1.15 m (3 ft 9¼ in) for baggage stowage.

The Turbo-Islander can be fitted with either of the wings developed for the Islander: the BN-2B-40 set with a span of 14.94 m (49 ft), or the BN-2B-41 set with the extended-tip span of 16.15 m (53 ft). These sharply raked-back tip extensions house additional fuel (111.5 litres [24½ Imp gal] in each), providing the Turbo-Islander with a maximum fuel weight of 849 kg (1872 lb). As with the Islander, the Turbo-Islander can also carry additional fuel tanks on pylons under the wings, each of the two tanks carrying 227 litres (50 Imp gal).

The first Turbo-Islander, with BN-2A-41 wings from an initial production Islander (rather than from the later Islander II which forms the basis of the Turbo Islander), flew on April 6, 1977. The basic Islander was placed in production in 1966 and by 1974 had become the most successful British multi-engined airliner, orders exceeding the figure of 540 achieved by the de Havilland Dove. This is all the more impressive when it is remembered that the Islander was designed and produced by a small company. Britten-Norman designed the Islander to meet the requirements of Cameroon Air Transport, in which it had a 25% holding, for a twin-engined short-range airliner able to seat at least six passengers, with good take-off performance and minimal maintenance requirements.

The BN-2 Islander first flew on June 13, 1965,

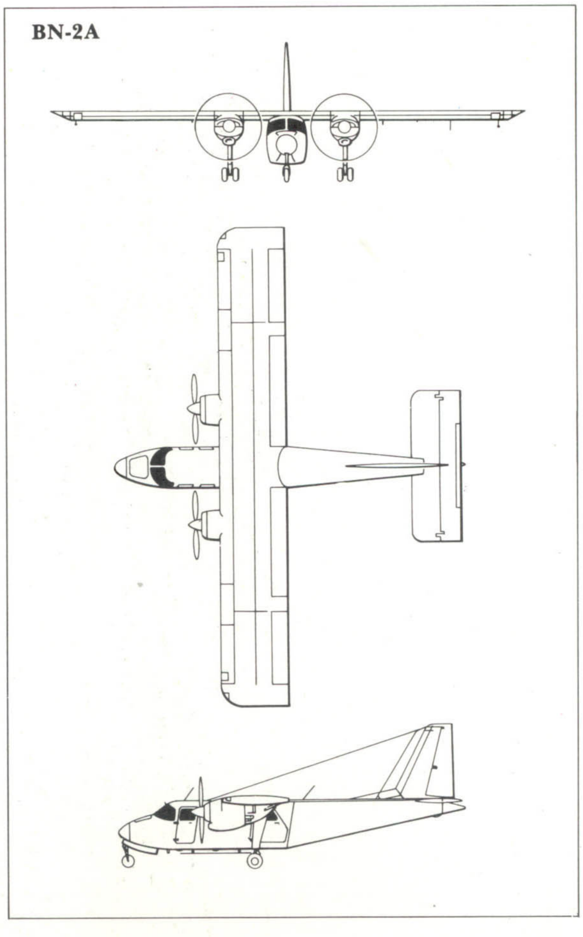
Top left: F-OCRG, one of four Islanders in service with the New Hebrides-based firm of Air Melanesiae at Port Villa in July 1977
Above left: An Islander of Munz Northern Airlines of Alaska, which was previously registered G-BDZL
Above: A pre-delivery flight for a Trislander for Inter-Island Airways of the Seychelles

Left: A Pilatus Britten-Norman Turbo-Islander over Southampton water

and in this prototype form was powered by two 210-hp Rolls-Royce Continental IO-360 piston engines. Performance was adequate but the designers felt that more power and increased wing area would be beneficial, and so the prototype was revised with 260-hp Lycoming O-540-E inlines and span increased from 13.72 m (45 ft) to 14.94 m (49 ft). The first production Islander flew on April 24, 1967, and deliveries began on August 13, 1967 to Glos-Air following the receipt of British certification on August 10. Type approval by the US Federal Aviation Administration followed on December 19, 1967.

The standard aircraft has proved highly successful and Britten-Norman has developed other variants to meet specific requirements: longer ranges made possible by the use of extra tanks in extended span wings of 16.15 m (53 ft); better hot and high performances bestowed by the installation of 300-hp Lycoming IO-540-K1B5 engines; other performance benefits are available with the use of supercharged TIO-540-K engines or standard engines fitted with Riley-Rajay superchargers; and extra capabilities can be bestowed by crop spraying and dusting equipment, a water-bombing installation, float or ski undercarriages, and a number of other detailed improvements.

The Trislander, evolved in 1968, is basically an Islander with a stretched fuselage capable of accommodating 17 passengers, and a third 260-hp Lycoming O-540-E4C5 engine mounted in a bullet, in a cell, half-way up the fin to ensure adequate performance at increased weight.

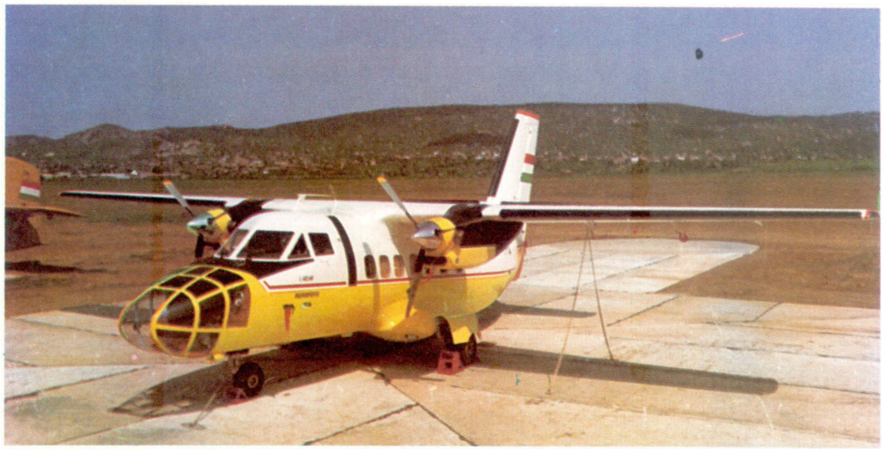


BN-2B-40 Turbo-Islander

Type: short-range transport
Maker: Pilatus Britten-Norman (Bembridge) Ltd
Span: 14.94 m (49 ft)
Length: 12.02 m (39 ft 5¼ in)
Height: 4.18 m (13 ft 8¾ in)
Wing area: 30.19 m^2 (325 sq ft)
Weight: maximum 3311 kg (7300 lb); empty not available
Powerplant: two 600-shp (flat-rated to 400-shp) Lycoming LTP101 turboprops
Performance: maximum cruising speed 354 km/h (220 mph) at 3048 m (10 000 ft); range with maximum fuel and reserves 1260 km (783 miles)
Payload: seats for up to 9 passengers
Crew: 1
Production: still under development

L-410, Let

FIRST FLIGHT 1969



THE L-410 Turbolet produced by the Let Narodni Podnik (Let National Corporation) is an interesting Czech competitor in the world market for a twin-turboprop third-level and commuter airliner, and is the first major type to be designed by the company. In common with most of its contemporary equivalents, the L-410 is a high-wing design, and it is capable of mixed freight/passenger operations.

The L-410 was from the beginning planned with a view to the same basic airframe being suitable for passenger, freight, aerial survey, flying ambulance, training and executive operations. Serious design work began in 1966 on the basic passenger version with seating for between 15 and 19 three-abreast (2+1) with the aisle offset to the left. At the same time the Motorlet company began full-scale development of the chosen engine, the Walter M 601 turboprop, rated at 740 ehp.

Essential features of the L-410 include a somewhat dumpy fuselage, a high-set straight wing with an aspect ratio of 9.3:1, a straight tailplane, a slightly swept fin and rudder assembly, and a retractable tricycle undercarriage. The main units of the undercarriage fold into large blisters on each side of the fuselage, thus keeping the fuselage as close to the ground as possible. This means that loading and unloading the L-410 is very simple (the door sills are only 0.8 m [2 ft 7½ in] from the ground). The seats can be stripped out of the aircraft quickly, and as the fuselage floor is at truck-bed height, freight transfer is singularly easy.

Provision was also made for the use of the L-410 for paratrooping, by the removal of both halves of the door in the left side of the rear fuselage; for de luxe transport, with individual seating for 12 passengers; for executive use with eight individual seats and four desks; and for flying ambulance work with provision for an attendant, five seated casualties and six litters. There are baggage compartments, in the nose and behind the passenger cabin, and a lavatory is standard.

Design and construction proceeded smoothly, but somewhat in advance of engine development. This meant that when the first prototype flew on April 16, 1969, it was powered by a pair of 715-ehp Pratt & Whitney Aircraft of Canada PT6A-27 turboprops. Despite the slightly lower power of the PT6A-27s compared with the M 601s planned, the

Above: A Let L-410AF (aerial photography and survey version). This example was the only one built of this subtype, and was exported to Hungary in 1974. The nose compartment was larger, wider and more extensively glazed than that of the L-410A passenger version
Below: An L-410 of Slov-Air; the first aircraft was delivered in 1971. During trials it proved superior to the Soviet Beriev Be-30

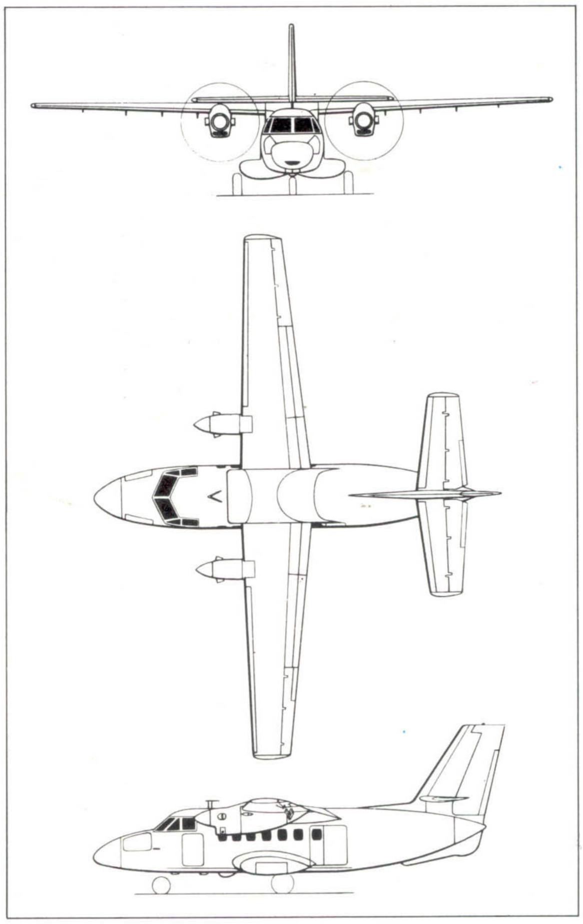
performance and handling of the four prototypes was more than adequate, the only problem being with airframe vibration and cabin noise, cured by the installation of Hartzell propellers.

Production of the L-410A, as the initial production model was designated, began in 1970 and the first aircraft was delivered to Slov-Air during 1971. Scheduled services began towards the end of the year. It was this model, which had slight increases in wing span and overall length compared with the prototypes, that proved superior to the Beriev Be-30 in comparative evaluation of the two types.

The next model was the L-410AF aerial-survey aircraft. This is derived from the L-410A, but has a larger, glazed nose for the navigator, two cameras in the lower fuselage, and a darkroom in the previous passenger accommodation. The nose modification, it should be noted, prevents the nosewheel from being retracted.

The M 601 turboprop finally made its appearance in the form of the 730-ehp M 601A on the L-410M. This model has seating for 17 passengers, and was first flown in 1973. Whereas the L-410A with Canadian engines is intended principally for the western market, the M 610A-engined L-410M is designed for the simpler needs of the Communist bloc airlines operating the type since 1976.

The latest version, whose designation is not yet known, is a stretched model currently under development. This has a fuselage some 0.6 m (1 ft 11⅔ in) longer than the L-410A and L-410M, presumably to accommodate an extra row of seats.



L-410A Turbolet

Type: short-range light transport
Maker: Let Národní Podnik
Span: 17.48 m (57 ft 4¼ in)
Length: 13.61 m (44 ft 7¾ in)
Height: 5.65 m (18 ft 6½ in)
Wing area: 32.86 m^2 (353⅔ sq ft)
Weight: maximum 5700 kg (12 566 lb); empty 3400 kg (7495 lb)
Powerplant: two 715-ehp Pratt & Whitney Aircraft of Canada PT6A-27 turboprops
Performance: maximum cruising speed 370 km/h (230 mph) at 3000 m (9842 ft); range with maximum payload 300 km (186 miles)
Payload: 1850 kg (4708 lb); seats for up to 19 passengers
Crew: 1 to 2
Production: minimum 95

DHC-7 Dash 7, deHavilland Canada

FIRST FLIGHT 1975

THE DHC-7 Dash 7 is perhaps one of the most important airliners developed in recent years, whose full impact on short-haul air transport will only become clear when the operating and 'environmental' aspects of its career are assessed in future years. The Dash 7 is the largest of the aircraft yet developed by de Havilland Canada, but is essentially the latest reflection of the company's continuing concern with STOL (short take-off and landing) aircraft.

The Dash 7 originated in 1972 after the manufacturer had examined carefully the market requirements for such an aircraft. What was needed, de Havilland Canada concluded, was an aircraft capable of offering 50 passengers all the comforts of 'full-size' airliners, yet able to operate from runways only 610 m (2000 ft) long in built-up urban areas where the aircraft's noise signature should be less than 95 EPNdBs (effective perceived noise decibels) 152 m (500 ft) from take-off or landing. In short, the Dash 7 was to offer airline comfort with highly competitive operating economics and 'quiet STOL' performance.

The building of two prototypes began in 1972 with funding supplied by the government of Canada. The key to the design was a high-wing, T-tail configuration powered by four 1120-shp Pratt & Whitney Aircraft of Canada PT6A-50 turboprops driving five-blade propellers, and fitted with a number of high-lift devices. The engine, derived from the PT6A-41 and designed with quietness in mind, is fitted with a special reduction gear to allow the use of a slow-turning five-blade propeller.

As usual with DHC aircraft, the high-lift features are aerodynamic, consisting of double-slotted flaps over some 80% of the trailing edges. Also provided on each wing are two inboard lift dumpers/ground spoilers and two outboard air spoilers, the latter being capable of symmetrical or differential action. The flap system is made the more effective for being located in the slipstream of the four large-diameter propellers.

The first prototype flew on March 27, 1975, the second joining it on June 26 of the same year. There followed a period of intensive trials to assess the performance of the aircraft in differing air and ground regimes. In general performance in all respects was found to be first class, noise levels being below those laid down, and field perform-

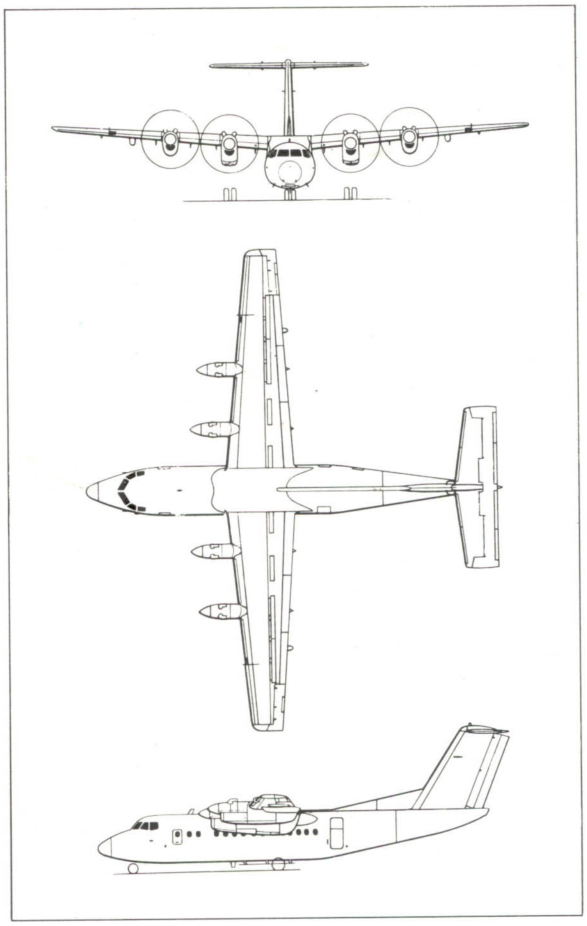
Above: A Greenlandair Dash 7 on the apron at Reykjavik airport. In 1980 the two examples operated by this airline were being used on Arctic communications
Below: The first prototype DHC-7 demonstrating the STOL (short take-off and landing) characteristic which is a feature of this aircraft

ance only slightly worse than hoped for (take-off run is 686 m [2250 ft] at sea level.

This convinced the Canadian government, which had bought de Havilland Canada in June 1974, to authorize the production of an initial batch of 50 Dash 7s, starting in 1976. The first such aircraft flew on May 30, 1977, and joined the two prototypes in the programme leading to Canadian certification on May 2, 1977. The problem now facing the manufacturer was that of sales, for although the type had quickly attracted interest, firm orders had been few. The first aircraft to enter service was the second production machine, which was delivered to Rocky Mountain Airways early in 1978 and entered service on February 3, 1978. During that year production ran at only one aircraft per month.

During 1979 the position altered radically in favour of the Dash 7, the aircraft's excellent operating record having convinced many sceptics. Production has been increased to three aircraft per month, and the factory is being expanded to make possible the production of four aircraft per month. Most importantly, the type has now been ordered by five US operators; deregulation in the USA has allowed many small operators to consider larger aircraft, and here the Dash 7 is a front runner.

Future developments may include a Dash 7 Series 200 with the uprated PT6A-55, and a Dash 7 Series 300 with a fuselage stretch to accommodate 60 passengers. Two variants in production are the DHC-7 Dash 7C freight model, and the DHC-7R Ranger maritime-reconnaissance model.



DHC-7 Dash 7

Type: short- and medium-range STOL transport
Maker: de Havilland Aircraft of Canada Ltd
Span: 28.35 m (93 ft)
Length: 24.58 m (80 ft 7¾ in)
Height: 7.98 m (26 ft 2 in)
Wing area: 79.9 m^2 (860 sq ft)
Weight: maximum 19 731 kg (43 500 lb); empty 12 178 kg (26 850 lb)
Powerplant: four 1120-shp Pratt & Whitney Aircraft of Canada PT6A-50 turboprops
Performance: maximum cruising speed 426 km/h (265 mph) at 4572 m (15 000 ft); range with maximum payload and reserves 1303 km (810 miles)
Payload: 5511 kg (12 150 lb); seats for up to 50 passengers
Crew: 3 to 4
Production: 20 orders, 20 options by 1980

AR 404, Ahrens

FIRST FLIGHT 1976

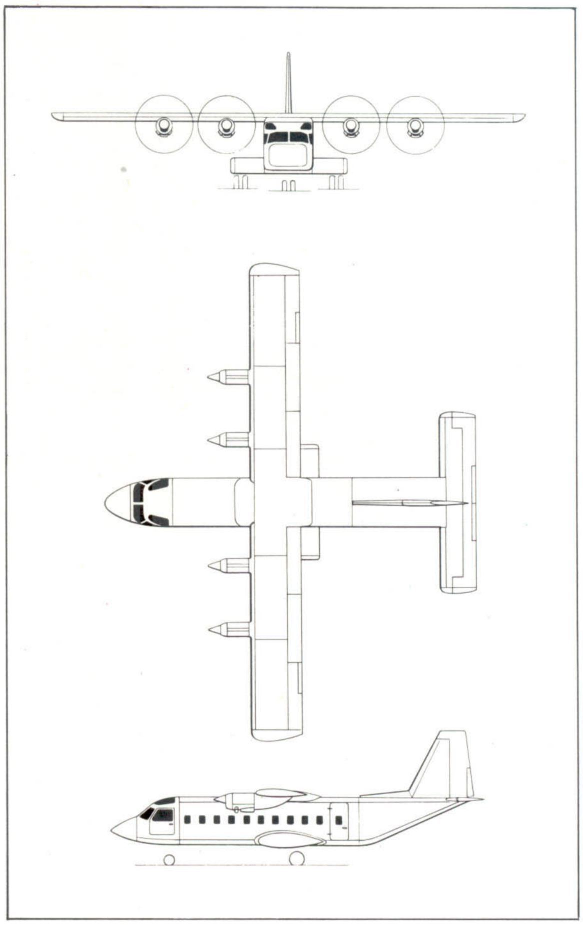
THE Ahrens AR 404 is conceived as a low-cost DC-3 replacement: a simple, sturdy utility aircraft capable of undertaking a number of functions with only minimal alterations. To this end the aircraft has been planned on the modular principle, with items such as engines replaceable in only 20 min. To simplify design, construction and maintenance, as well as the loading of pallets and containers, a square-section fuselage has been adopted. To the front of this is attached the cockpit section together with the nose, while to the rear is fixed the tail section carrying the empennage and loading door.

The parallel-cord wing with its underslung engine pods, is a single structure attached to the upper surface of the fuselage to avoid encroachment into the payload volume. The retractable tricycle undercarriage has short legs to keep the fuselage close to the ground and the main units retract in sponsons on the lower fuselage sides.

Design of this interesting 'minimum aircraft' began in January 1975, construction of the prototype, which had a fixed undercarriage, being started in August 1975. This prototype flew on December 1, 1976. At this stage work was carried on by the Ahrens Aircraft Corporation in California, but the project was later transferred to Puerto Rico, whose government offered to finance the project and then help launch an initial batch of 18 production aircraft. In Puerto Rico, therefore, Ahrens Aircraft maintain the progress of the aircraft towards certification, with the parent company doing sub-assembly work. US Federal Aviation Administration Type Approval was secured in the closing stages of 1978, and by 1980 production was well underway.

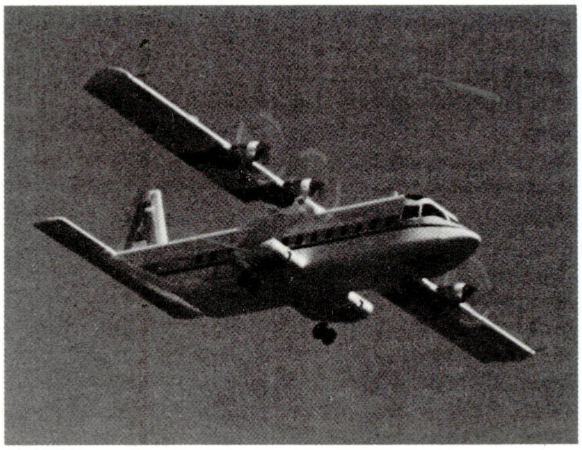
The key to the aircraft's internal simplicity is the provision of a five-track restraint system in the fuselage floor. This can be used for the anchoring of seating for 30 (2+1) with an offset aisle for the commuter role, or alternatively for the lashing down of freight (12 D-3 containers) or the installation of rollers for the handling of pallets.

Passengers board the aircraft by means of doors on each side of the fuselage aft of the wing, while freight can be loaded straight into the fuselage, the undersurface of the rear fuselage being a two-part door, the lower half of which forms a loading ramp. This can be left open in flight for the carriage of large loads, or for the dispatch of paratroops.



AR 404

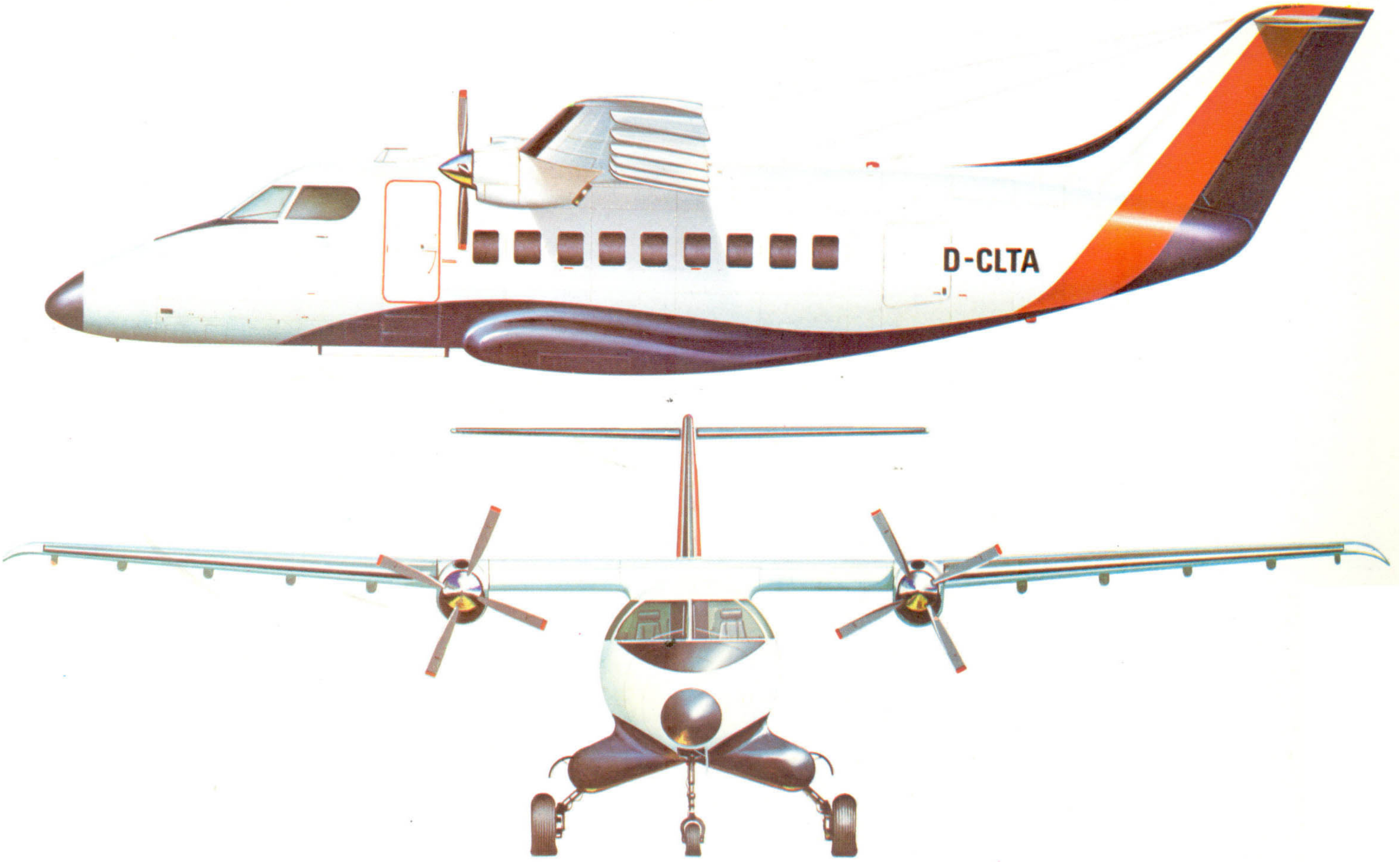
Type: short- and medium-range utility transport
Maker: Ahrens Aircraft Inc
Span: 20.12 m (66 ft)
Length: 16.08 m (52 ft 9 in)
Height: 5.33 m (17 ft 6 in)
Wing area: 39.2 m² (422 sq ft)
Weight: maximum 7711 kg (17 000 lb); empty 3719 kg (8200 lb)
Powerplant: four 420-shp Allison 250-B17B turboprops
Performance: maximum cruising speed 314 km/h (195 mph) at 1524 m (5000 ft); range with standard fuel but no reserves 1575 km (978 miles)
Payload: seats for up to 30 passengers
Crew: 2
Production: 18 by 1980



Left and below: The AR 404, which was conceived as a 'minimum aircraft', with an emphasis on simplicity and versatility. It can be used in a cargo or passenger-carrying role. Up to 30 seats can be attached to the strong cargo floor of the fuselage. The type is intended to appeal to operators in undeveloped areas

LTA, Dornier

ESTIMATED FIRST FLIGHT 1982



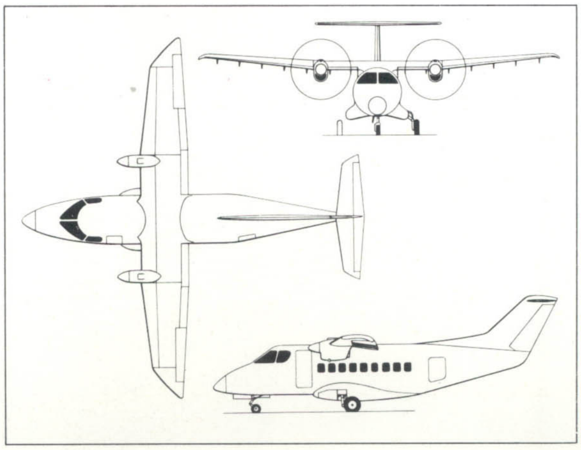
Above: The Dornier LTA, Light Transport Aircraft, uses a mix of advanced design features and modern materials. The wing, with its downward-curving tips and slotted Fowler flaps, is designed to give high-lift and positive gust-absorption

THE Dornier LTA is planned as an advanced-technology Light Transport Aircraft for service in the mid 1980s. Of basically conventional configuration (high-wing and T-tail layout, with a circular-section fuselage and tricycle undercarriage whose main units retract into fuselage blisters), the unusual features of the LTA lie in its use of the latest structural techniques, using advanced materials, and supercritical aerodynamics. The supercritical-section wing, on which the success of the LTA will ultimately depend, was due for flight testing during 1979 on a converted Dornier Do 28D-2 Skyservant.

The LTA's wing is to be of a Dornier-developed supercritical section, made of a combination of advanced-technology and conventional materials, and incorporating positive gust-absorption capacity with active controls, derived from the ZKP programme run jointly by Dornier and DFVLR. The wing leading edges, together with the raked and highly cambered wingtips, are to be made of a Kevlar/glassfibre composite, the slotted Fowler flaps and ailerons are to be made of carbon-fibre composites, and the rest of the wing is to be of conventional light-alloy construction. The ailerons are to be capable of differential action in their capacity as roll controllers, and of symmetrical action to supplement the flaps in providing nearly full-span trailing-edge high-lift devices for take-off and landing.

Kevlar/glassfibre will also be used for the nose, tailcone and main gear blisters, and for the leading edges of the fin and tailplane. The rudder and elevator will be of carbon-fibre composite. The rest of the fuselage and empennage will be of light-alloy construction, but the use of the advanced materials is expected to make significant contributions to the reduction of structure weight.

Two models of the LTA are envisaged. The Basic LTA is to have a crew of two, and accommodation for 19 passengers in an unpressurized cabin. A wardrobe and lavatory will be standard. The other model, which is to be known as the Commuter, is to seat 24 passengers, the extra capacity being obtained by sacrificing the wardrobe and lavatory. Seating will comprise seven pairs of seats on the right side of the cabin, separated by an aisle from six single seats along the left side, with four seats abreast occupying the rear of the cabin.

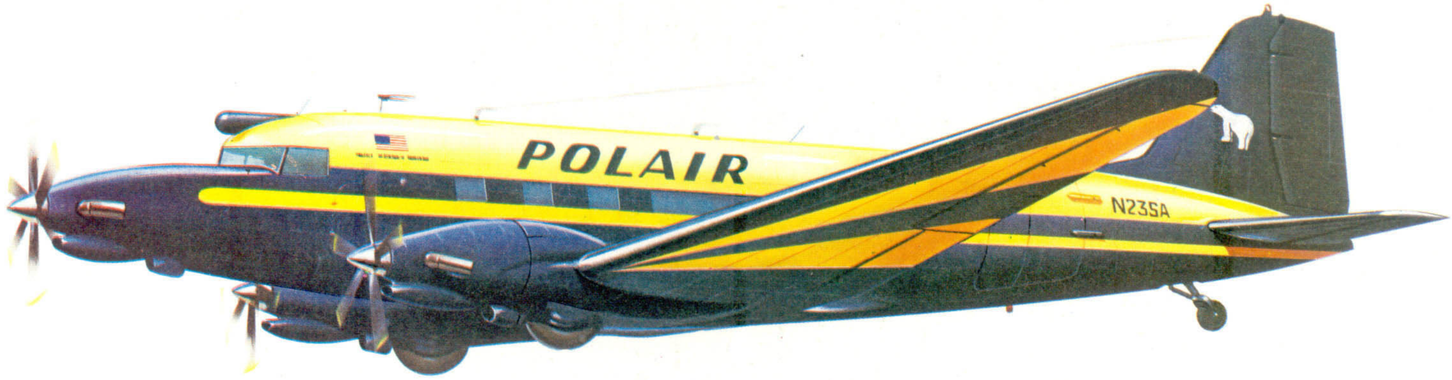


Commuter

Type: short-range light transport
Maker: Dornier GmbH
Span: 17.81 m (58 ft 5¼ in)
Length: 16.6 m (54 ft 5½ in)
Height: 5.55 m (18 ft 2½ in)
Wing area: 33.93 m^2 (365¼ sq ft)
Weight: maximum 6850 kg (15 102 lb); empty 3544 kg (7813 lb)
Powerplant: two 725-shp Garrett-AiResearch TPE 331-8 turboprops
Performance: (estimated) maximum cruising speed 410 km/h (255 mph) at 3000 m (9842 ft); range with 24 passengers 400 km (249 miles)
Payload: seats for up to 24 passengers
Crew: 2 to 3
Production: still under development

Tri Turbo-3, Specialized Aircraft

FIRST FLIGHT 1977



SINCE the introduction of turboprop engines, many ambitious small companies have considered the attractive prospect of producing a DC-3 replacement not in the form of a new aircraft, but rather in the form of a turboprop-powered DC-3.

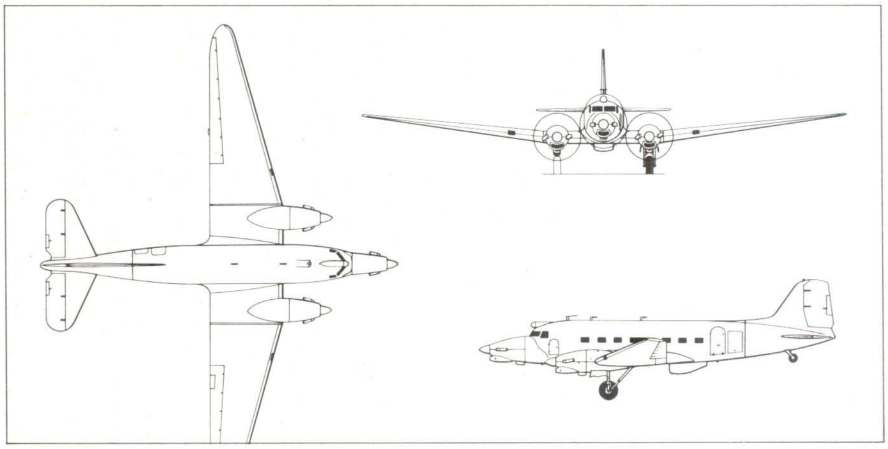
The most ambitious such project has been the Tri Turbo-3, produced by the Aircraft Technical Services Corporation on behalf of the Specialized Aircraft company. Taking as a starting point the Conroy Super Turbo-Three, previously engined with a pair of Rolls-Royce Dart turboprops, ATSC during 1977 developed the Tri Turbo-3 powered by three 1174-ehp Pratt & Whitney Aircraft of Canada PT6A-45 turboprops, one in each of the wing positions, and the third in the fuselage nose.

Despite the increase in the number of engines, the inherently lower weight of the turboprops has helped to reduce basic aircraft weight considerably, and it is this factor which has helped raise the type's payload to 5443 kg (12 000 lb) from the DC-3's 2994 kg (6600 lb), and also enabled the type to undertake operations in 'hot and high' conditions which would defeat the DC-3.

The Tri Turbo-3 first flew on November 2, 1977, and the type's certification in 1978 was purely for transport operations. Specialized Aircraft's plans are now to offer the type in several forms, the customer being given the option of having his own DC-3 converted by the company to the new standard, or alternatively to undertake the conversion himself in some 3000 man-hours with the aid of a kit; a third option is to buy a converted aircraft from Specialized Aircraft. There is also the option of two basic powerplants: the 1174-ehp PT6A-45 driving a three-blade propeller, or the 903-ehp PT6A-41 driving a four-blade propeller.

Key to the Tri Turbo-3's performance is the nose-mounted engine. This is used mainly for take-off and high-speed cruise, being shut down and propeller feathered for economical cruise. For example, the maximum cruising speed of 370 km/h (230 mph) at 3048 m (10 000 ft) on three engines is reduced to 290 km/h (180 mph) at optimum altitude on two engines; conversely, range with optional outboard wing tanks is 4345 km (2700 miles) on three engines, but 5150 km (3200 miles) on two engines.

The utility of the type is further increased by the provision, tested during 1979, of a swing-tail to facilitate the loading of bulky items.



Tri Turbo-3

Type: short- and medium-range transport
Maker: Specialized Aircraft Co
Span: 28.96 m (95 ft)
Length: not available
Height: 5.56 m (18 ft 3 in)
Wing area: 91.7 m^2 (987 sq ft)
Weight: not available
Powerplant: three 1174-ehp Pratt & Whitney Aircraft of Canada PT6A-45 turboprops
Performance: cruising speed 370 km/h (230 mph); range 4345 km (2700 miles)
Payload: 5443 kg (12 000 lb)
Crew: 3
Production: 1 (prototype) by 1980

Top: The DC-3 airframe is clearly recognizable in this Polair Tri Turbo-3
Above left: The *Spirit of Hope*; the central engine is used for take-off and high-speed cruise
Left: The flight-deck of a Tri Turbo-3. Converting the airframe takes 3000 man-hours

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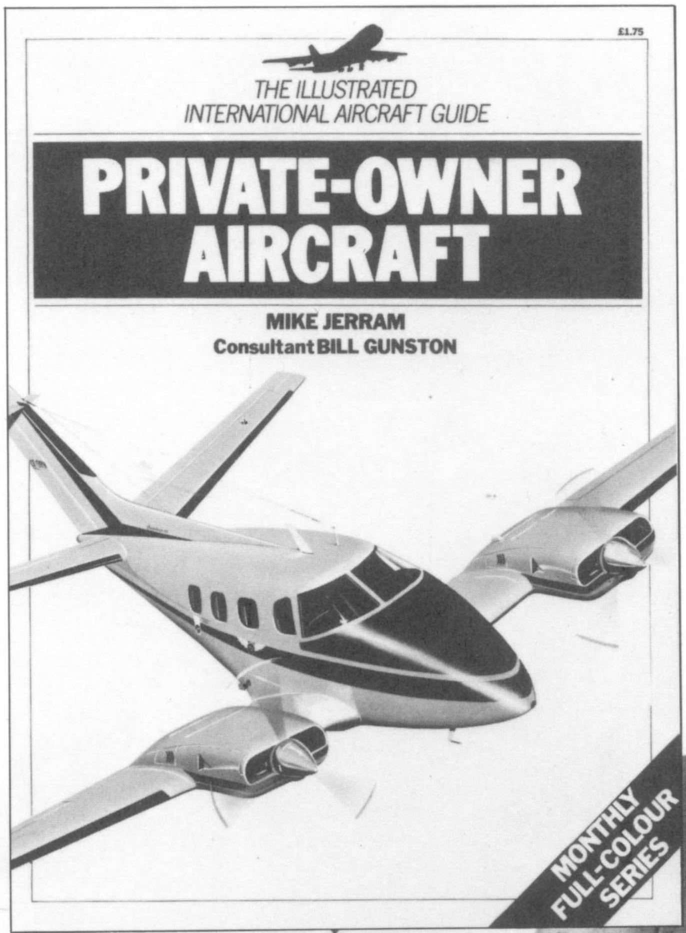

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